

CAFO Monitoring 2005



Iowa DNR – Ambient Air Monitoring Group

CAFO Monitoring in 2005

Ten monitoring sites were operated during 2005 by houses located near some the largest confined animal feeding operations in the state. A background ammonia monitoring site without nearby animal feeding operations is also operated at Viking Lake State Park. Data from this site has been included in this report for comparison purposes. Details regarding the general location of these monitors, and the name of the closest animal feeding operation, are presented in the maps and table on pages 4-6. Raw data used to create this document was downloaded from the AIRS database on 2/6/2006.

Chapter 32 of 567 (455B) establishes the health effects value (HEV), and health effects standard (HES) for hydrogen sulfide. The HEV is the threshold for adverse health effects, and the HES is the threshold for regulatory action.

The HEV for hydrogen sulfide is 30 parts per billion (ppb) for a one-hour average. An hourly average of 31 ppb is the lowest value that exceeds the hydrogen sulfide HEV. An annual eighth-highest daily maximum hourly average of 31 ppb is the lowest value that exceeds the hydrogen sulfide HES.

In 2005, the HEV was exceeded at two monitoring sites, Jewell and Newkirk. Jewell recorded three HEV exceedances, and Newkirk recorded four HEV exceedances. There were no sites that violated the HES in 2005.

Summary charts of hourly data completeness and measured pollutant concentration statistics and several types of graphs have been plotted for each site:

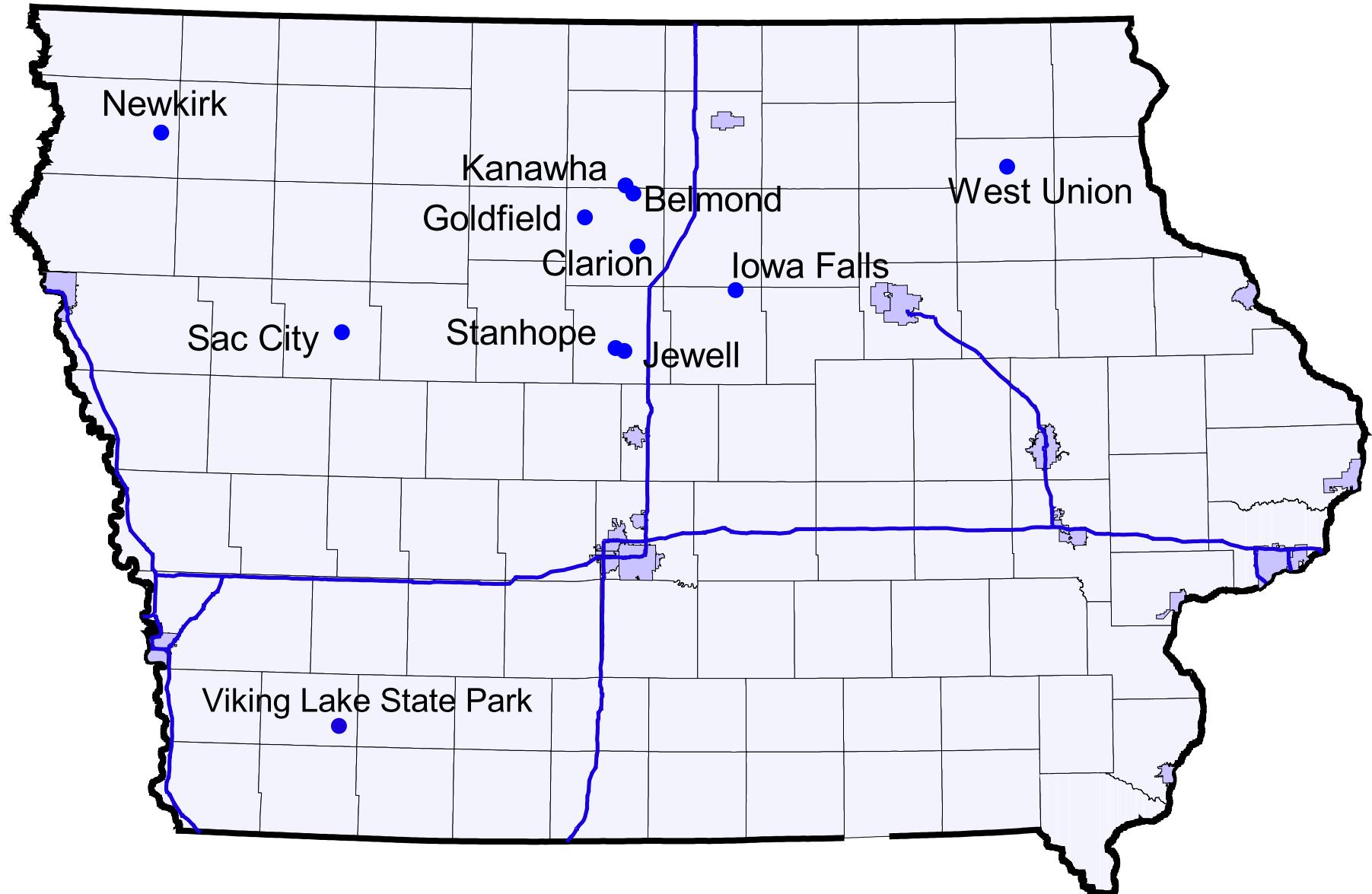
- The concentration of each pollutant (in parts per billion by volume) is plotted against time. Data that failed quality assurance checks, along with instrument malfunctions, has been omitted.
- The second type of graph shows the relationship between pollutant concentration and wind speed. This type of graph can be useful along with locational data for analysis of the pollutant dilution and possible effects of other sources.
- Graphs have also been included to show if there is any relationship between the measured concentrations of hydrogen sulfide and ammonia where appropriate.

- The second last type of graph is pollutant concentration plotted against wind direction. The direction the wind is coming from is specified using an angle between 0 and 359 degrees. 0 represents a wind from due north, 90 from due east, etc.
- The last plot in each series shows how wind speed varies with wind direction.
- Wind direction becomes ambiguous at very low wind speeds. Graphs that include wind direction have been modified to only show wind direction if the average wind speed was greater than zero.

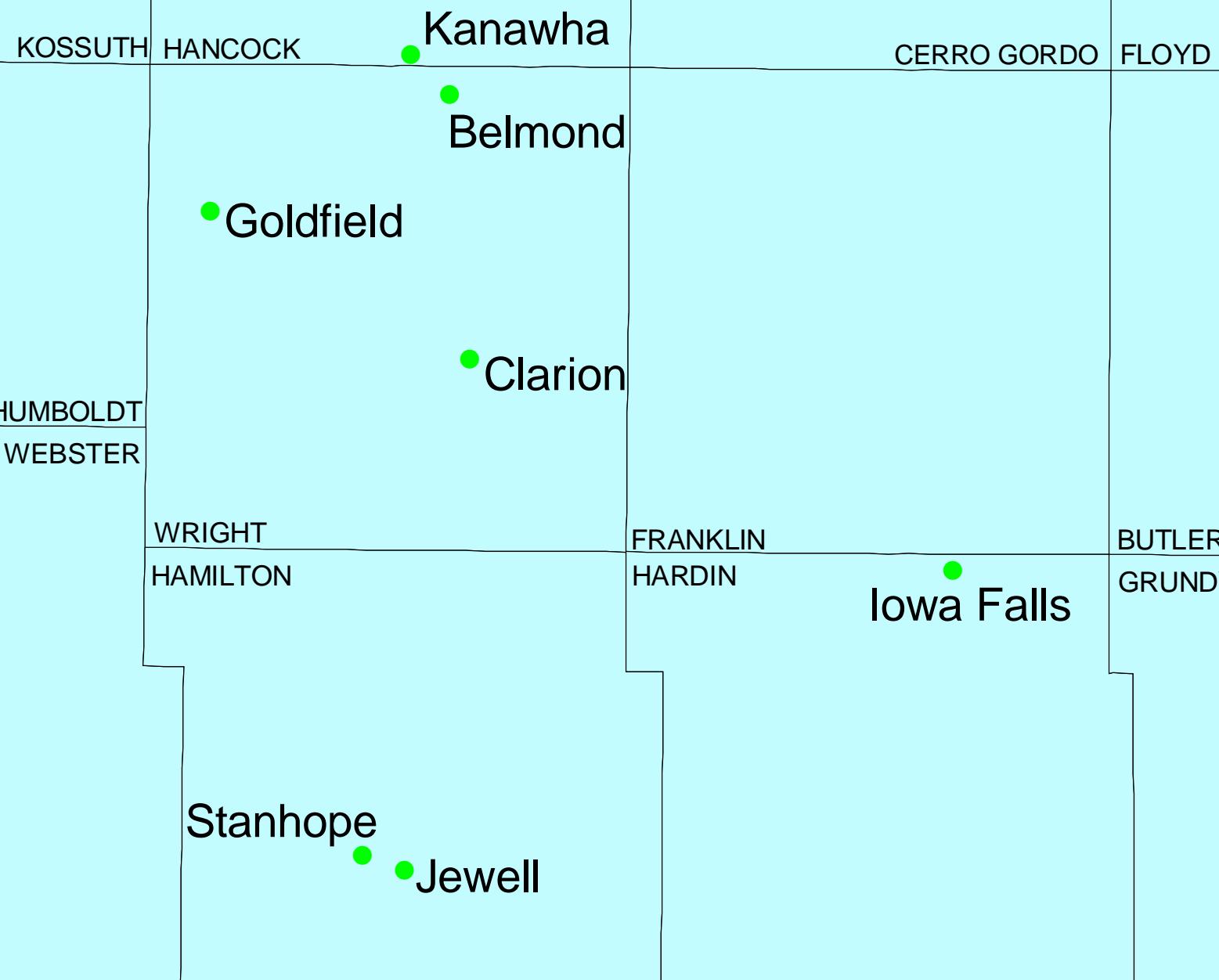
CAFO Monitoring Sites - 2005 Network

Nearby Town	County	Animal Type	Closest Facility	Site Type	Permitted Weight in lbs.
Belmond (New)	Wright	Swine	Buseman/Halfpop	1	2,310,000
Clarion	Wright	Swine	DeCoster #15	1	1,827,265
Goldfield	Wright	Swine	McCutcheon	1	2,475,000
Iowa Falls	Hardin	Swine	Stockdale	1	1,502,500
Jewell	Hamilton	Swine	Miller	1	1,462,500
Kanawha	Hancock	Swine	Fishjohn	1	2,310,000
Newkirk	Sioux	Dairy Cattle	Hickory Hills	1	2,390,000
Sac City	Sac	Swine	Withum	1	1,890,000
Stanhope	Hamilton	Swine	Winniger	1	2,475,000
Stanton (Viking Lake)	Montgomery	---	None-Background Monitor	---	---
West Union	Fayette	Poultry	IVA Inc	1	3,030,000

Site Type	Explanation
1	In ambient air, on property associated with a residence, close to house
2	In ambient air, on property associated with a residence, close to an animal feeding operation
3	In ambient air, not on property associated with a residence



CAFO Sites In Hamilton, Hardin and Wright Counties 2005 Network



Hydrogen Sulfide

2005 Hourly Summary Statistics

Statistic/Site Name	Belmond	Clarion	Goldfield	Iowa Falls	Jewell	Kanawha	Newkirk	Sac City	Stanhope	West Union
Total Hours	7855	7533	8170	8681	8650	8208	8299	8351	8695	8672
Capture Percentage	90%	86%	93%	99%	99%	94%	95%	95%	99%	99%
Minimum (ppb)	0	0	0	0	0	0	0	0	0	0
Maximum (ppb)	8	18	9	16	32	11	143	19	24	2
Average (ppb)	0	0	0	0	0	0	0	0	0	0

Percentile	Belmond	Clarion	Goldfield	Iowa Falls	Jewell	Kanawha	Newkirk	Sac City	Stanhope	West Union
100%	8	18	9	16	32	11	143	19	24	2
90%	0	1	1	0	1	1	1	1	1	0
80%	0	1	0	0	0	1	0	0	0	0
70%	0	0	0	0	0	0	0	0	0	0
60%	0	0	0	0	0	0	0	0	0	0
50%	0	0	0	0	0	0	0	0	0	0
40%	0	0	0	0	0	0	0	0	0	0
30%	0	0	0	0	0	0	0	0	0	0
20%	0	0	0	0	0	0	0	0	0	0
10%	0	0	0	0	0	0	0	0	0	0

Maximum	Belmond	Clarion	Goldfield	Iowa Falls	Jewell	Kanawha	Newkirk	Sac City	Stanhope	West Union
1	8	18	9	16	32	11	143	19	24	2
2	7	15	8	12	31	7	47	15	23	2
3	7	14	8	12	31	7	45	14	23	1
4	7	14	7	11	24	6	36	13	21	1
5	7	13	7	10	22	6	27	13	20	1
6	6	13	7	9	21	6	27	11	19	1
7	6	12	7	8	20	6	25	11	19	1
8	6	11	7	7	19	6	23	11	19	1
9	6	11	6	7	18	6	23	10	19	1
10	6	10	6	6	18	6	22	10	18	1

Ammonia

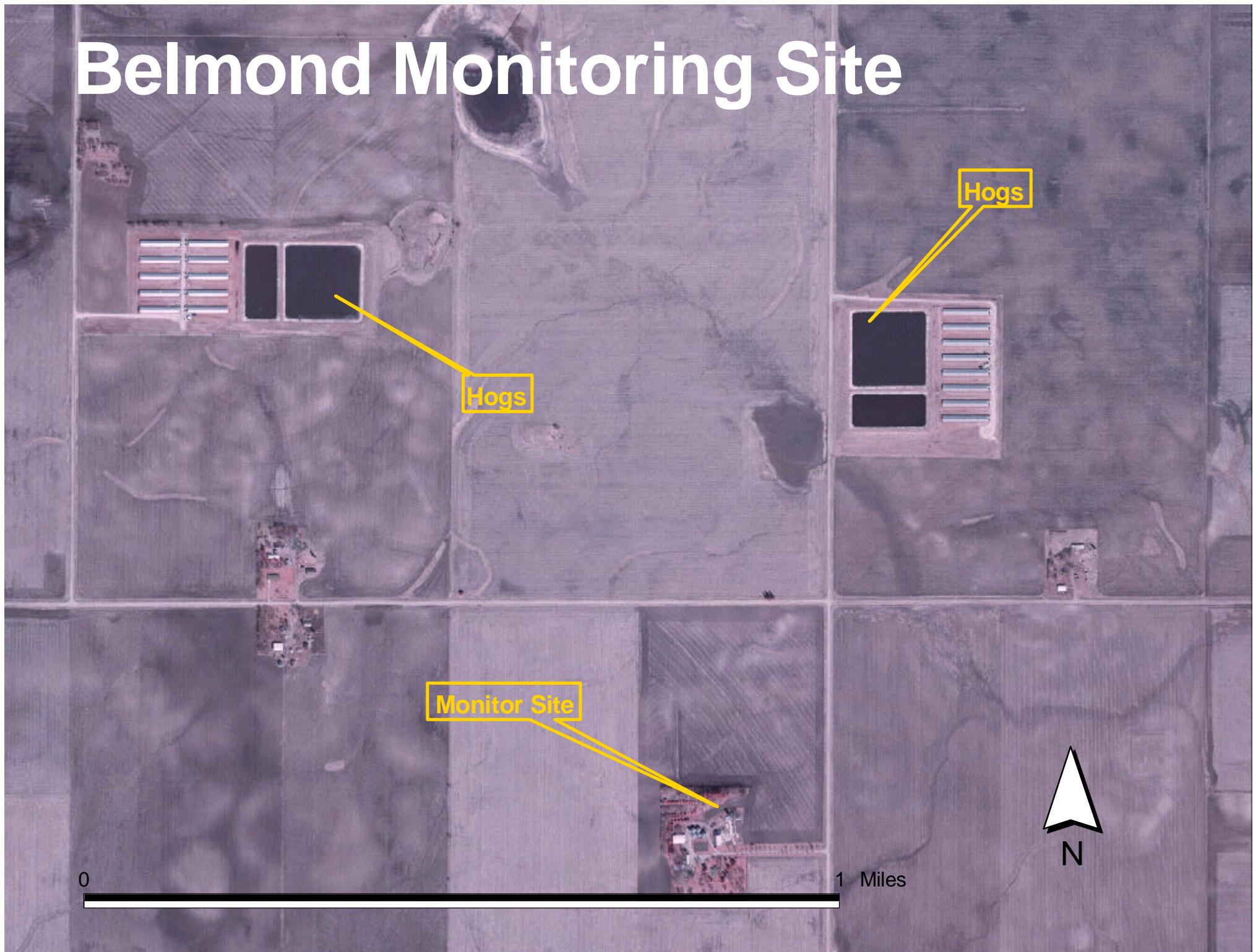
2005 Hourly Summary Statistics

Statistic/Site Name	Belmond	Clarion	Goldfield	Iowa Falls	Jewell	Kanawha	Newkirk	Sac City	Stanhope	Stanton	West Union
Total Hours	8610	7853	8299	8431	8581	8341	8613	8598	8615	8450	8574
Capture Percentage	98%	90%	95%	96%	98%	95%	98%	98%	98%	96%	98%
Minimum (ppb)	0	0	0	0	0	0	0	0	0	0	0
Maximum (ppb)	476	508	783	427	876	548	730	317	1045	110	454
Average (ppb)	12	21	11	26	20	15	12	11	21	3	15

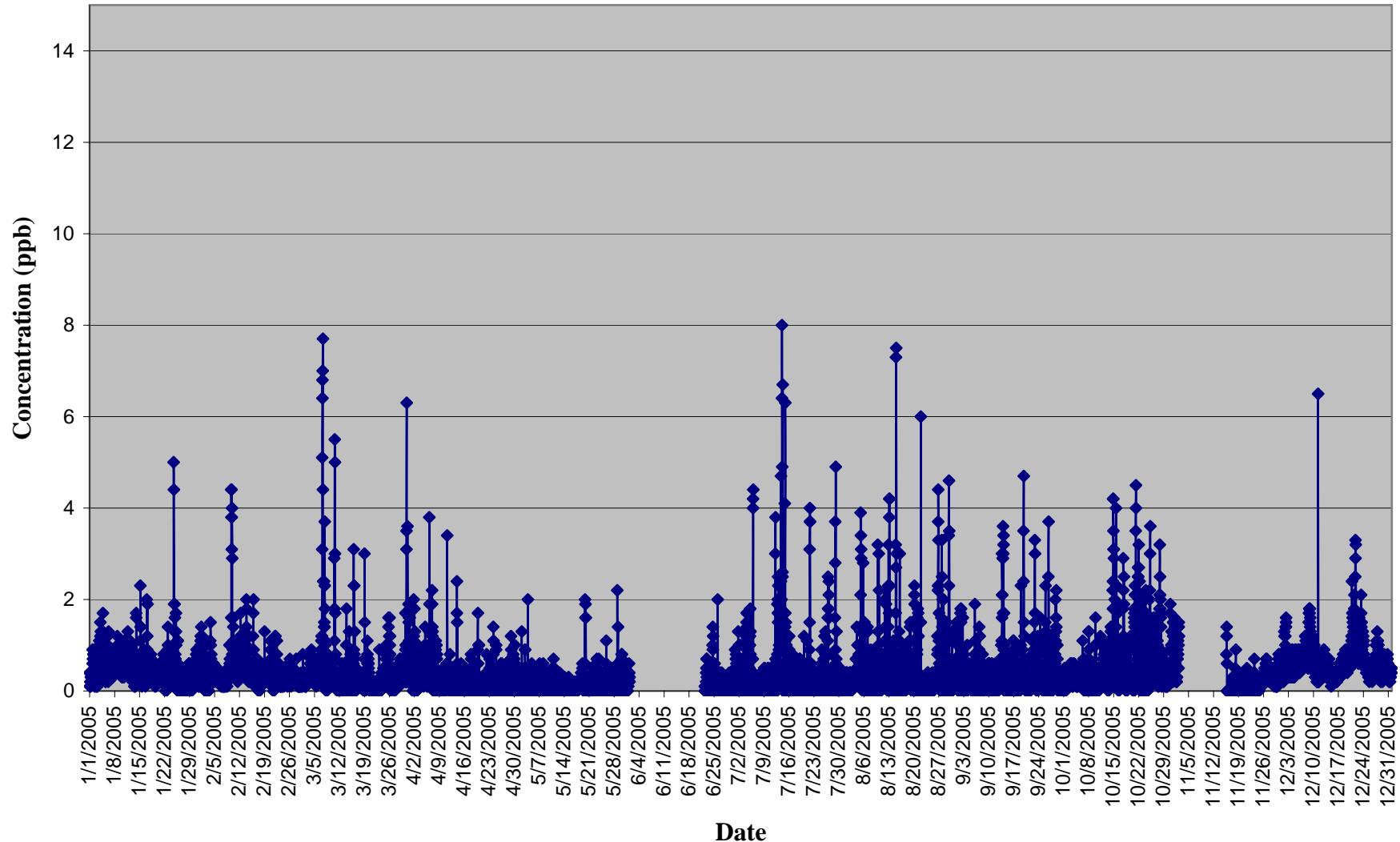
Percentile	Belmond	Clarion	Goldfield	Iowa Falls	Jewell	Kanawha	Newkirk	Sac City	Stanhope	Stanton	West Union
100%	476	508	783	427	876	548	730	317	1045	110	454
90%	23	44	24	46	35	34	22	26	37	7	29
80%	16	28	15	35	25	22	15	17	28	5	20
70%	13	21	11	29	21	15	12	13	22	4	16
60%	10	16	8	26	18	11	9	10	19	3	13
50%	8	12	6	23	16	8	8	7	15	2	10
40%	6	9	5	20	14	6	6	5	12	2	8
30%	5	6	4	17	11	4	4	3	10	1	6
20%	3	4	2	12	9	2	3	1	7	0	4
10%	2	2	0	8	6	0	2	0	4	0	2

Maximum	Belmond	Clarion	Goldfield	Iowa Falls	Jewell	Kanawha	Newkirk	Sac City	Stanhope	Stanton	West Union
1	476	508	783	427	876	548	730	317	1045	110	454
2	353	478	761	385	721	393	721	250	860	100	367
3	274	466	702	319	705	383	707	203	787	60	329
4	270	466	375	289	480	363	682	201	763	49	322
5	268	438	368	280	387	340	636	181	754	39	303
6	255	434	288	279	346	302	634	178	742	38	273
7	253	430	255	272	298	290	624	170	604	35	262
8	252	409	247	268	296	278	511	169	561	34	241
9	229	403	210	260	276	261	495	168	559	32	241
10	225	402	208	243	276	242	456	166	523	31	235

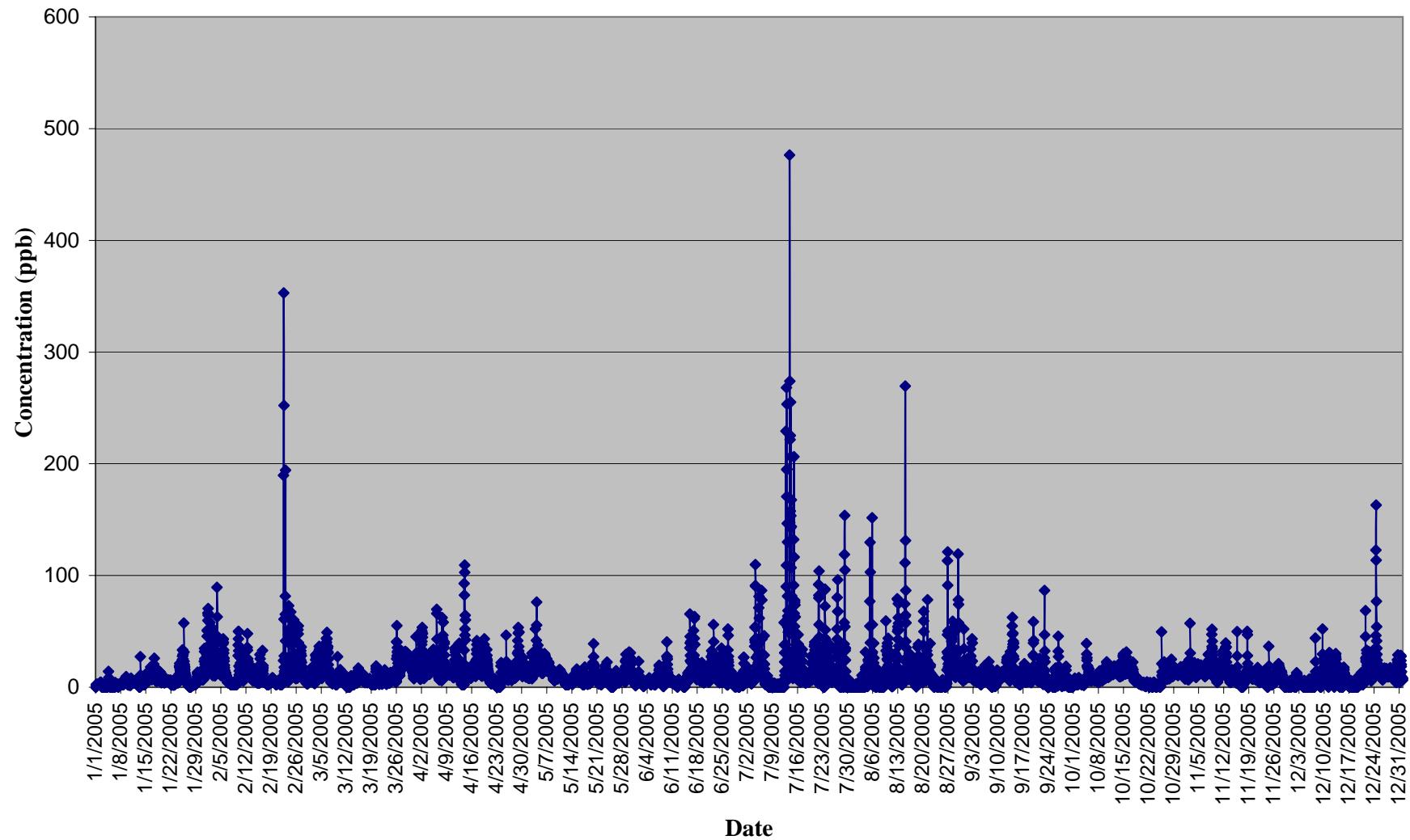
Belmond Monitoring Site



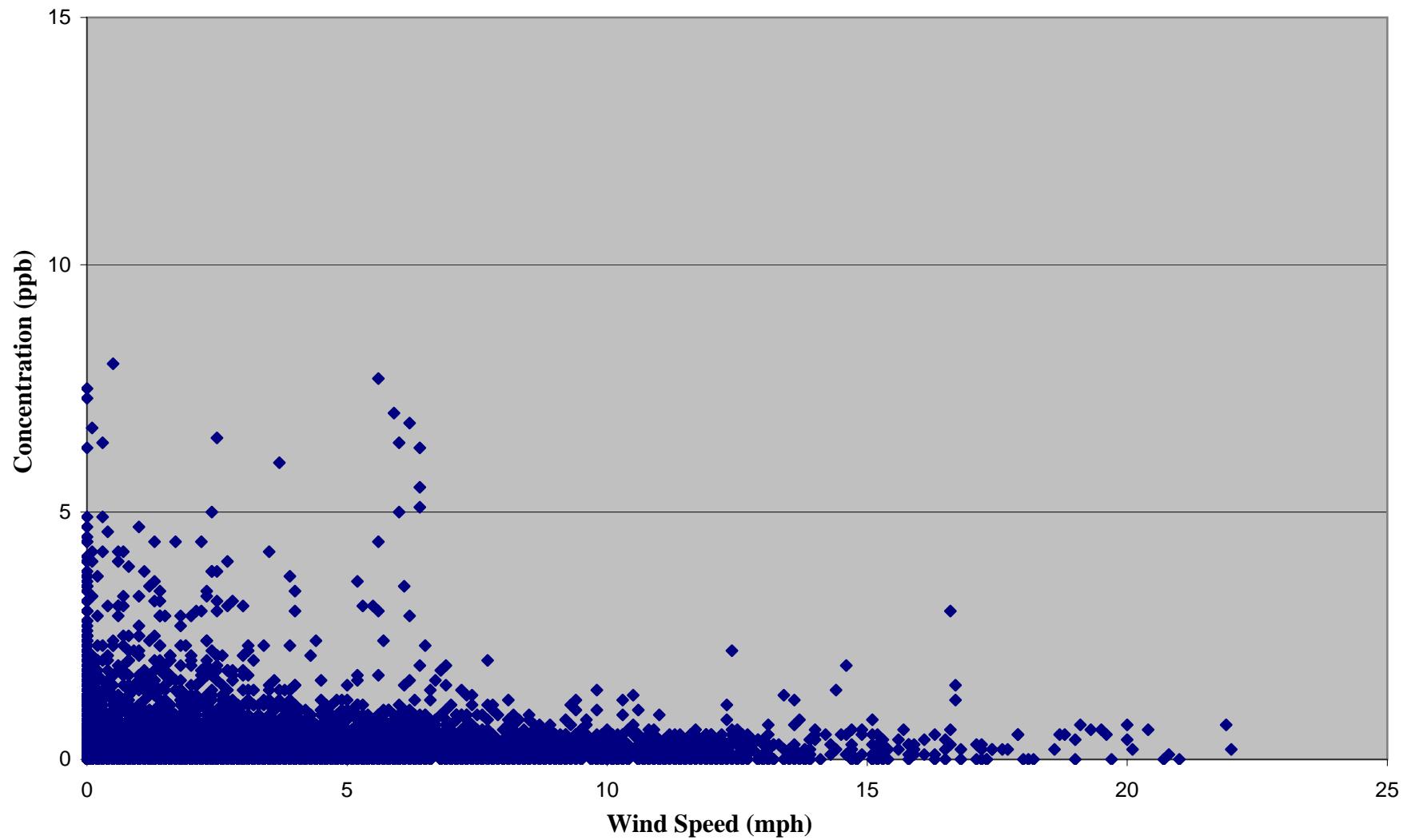
Belmond CAFO: Hydrogen Sulfide vs Time



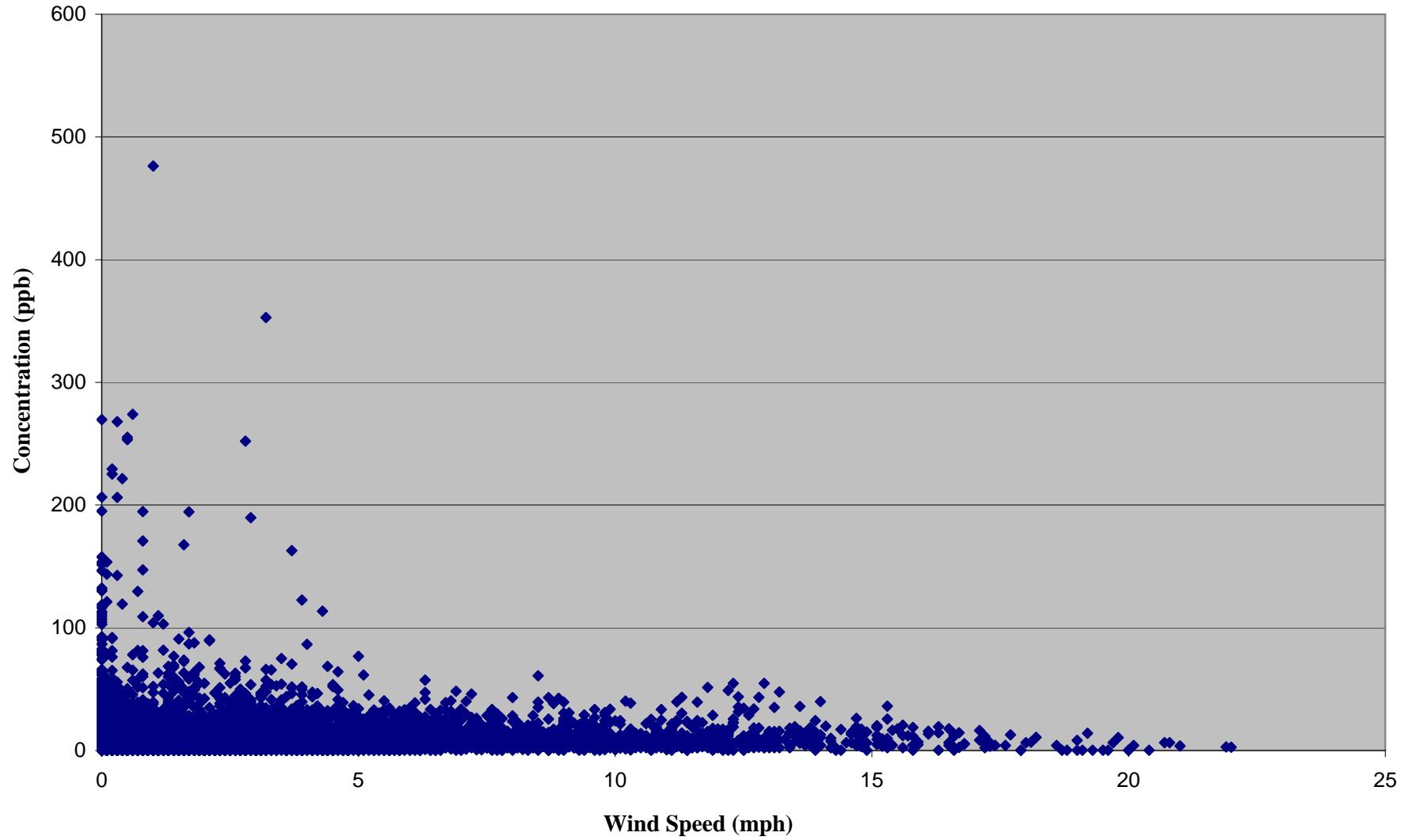
Belmond CAFO: Ammonia vs Time



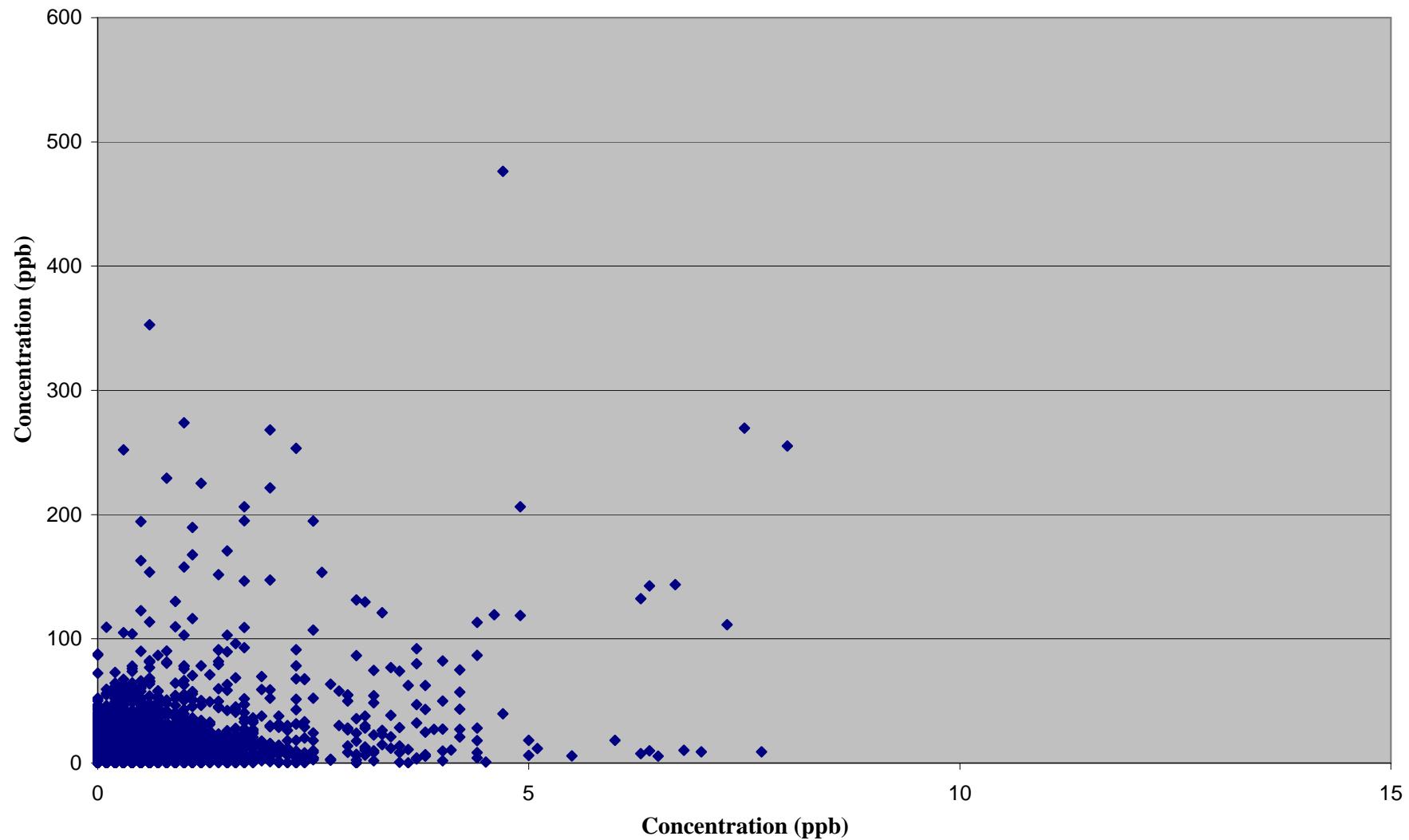
Belmond CAFO: Hydrogen Sulfide vs Wind Speed



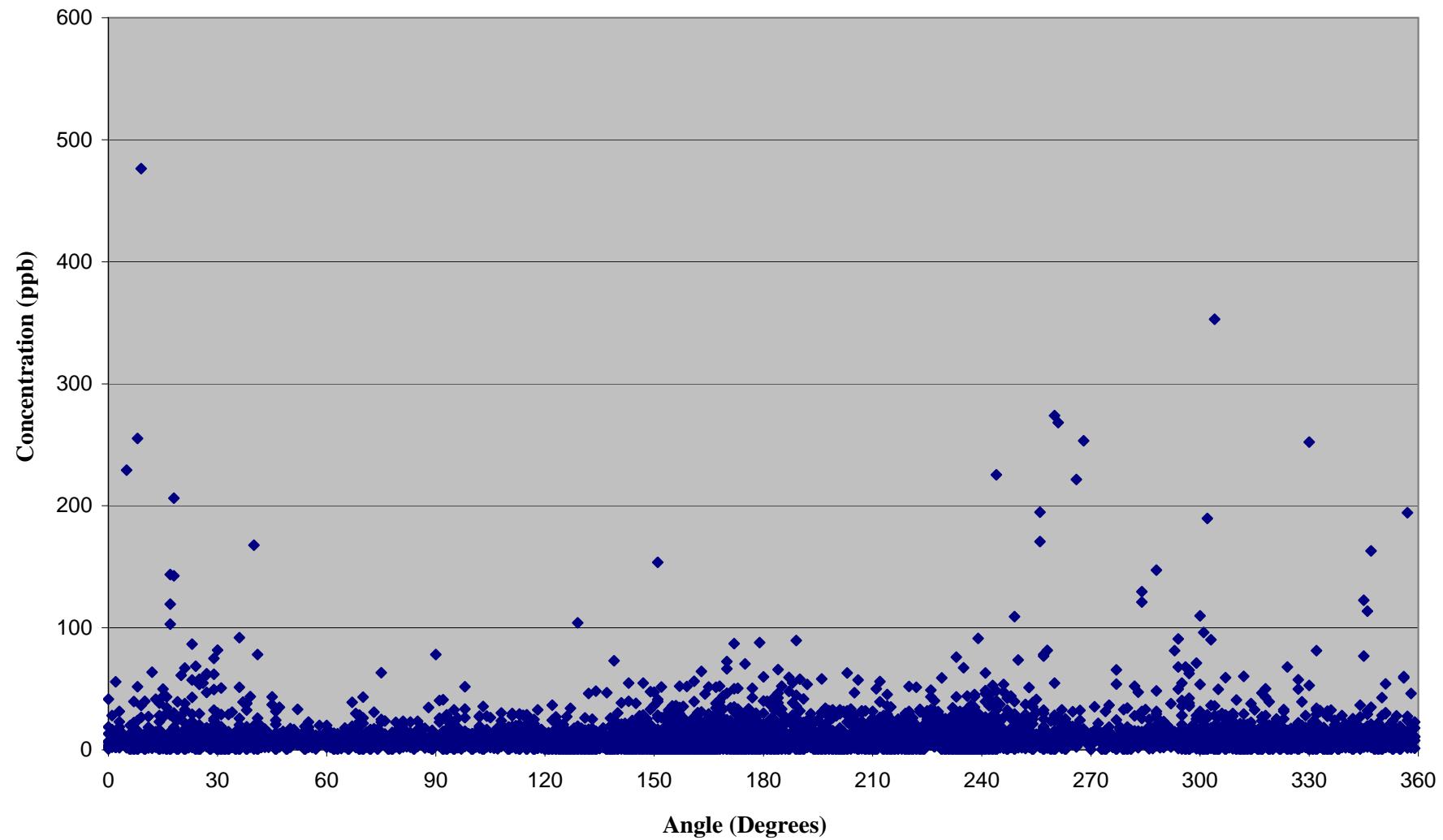
Belmond CAFO: Ammonia vs Wind Speed



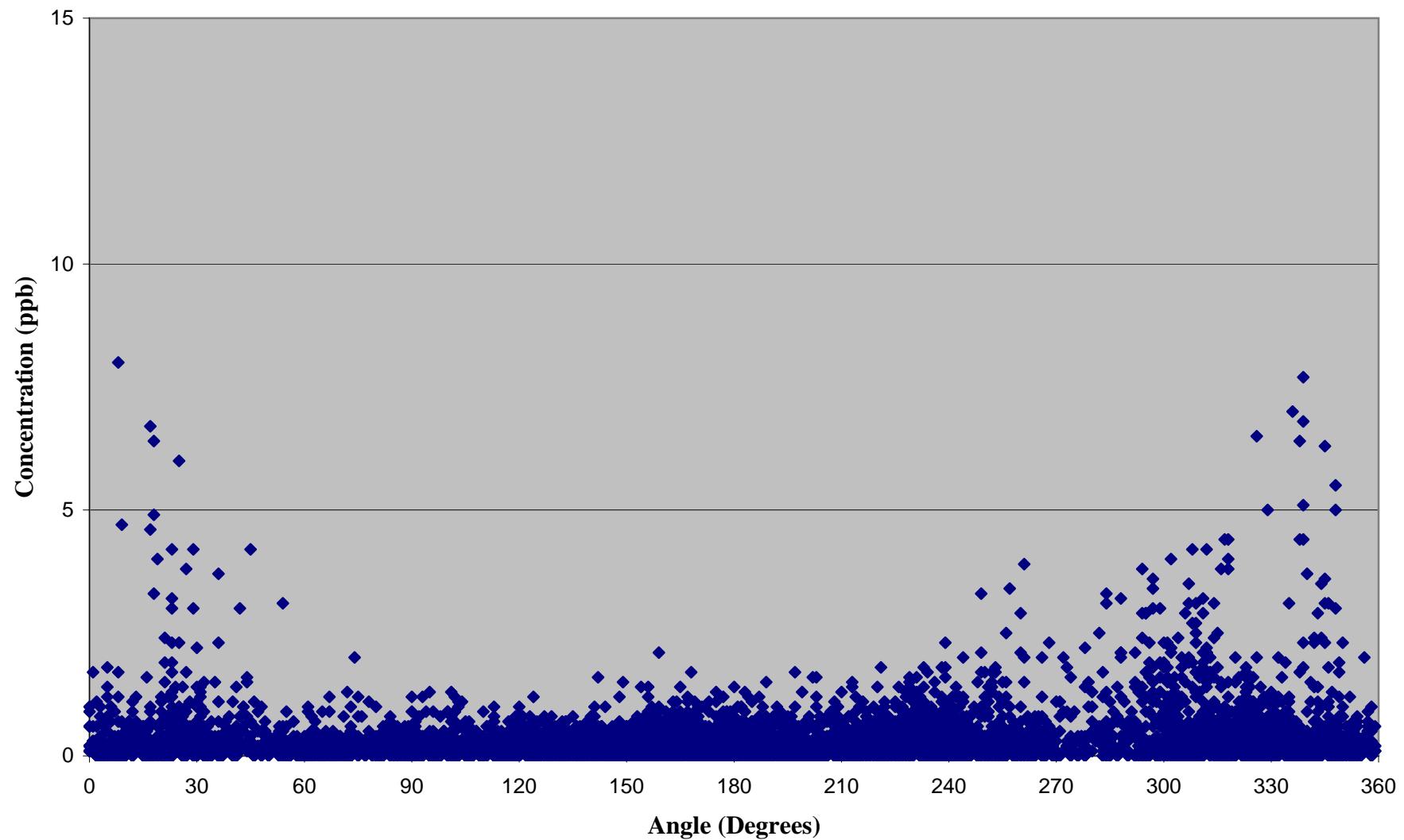
Belmond CAFO: Ammonia vs Hydrogen Sulfide



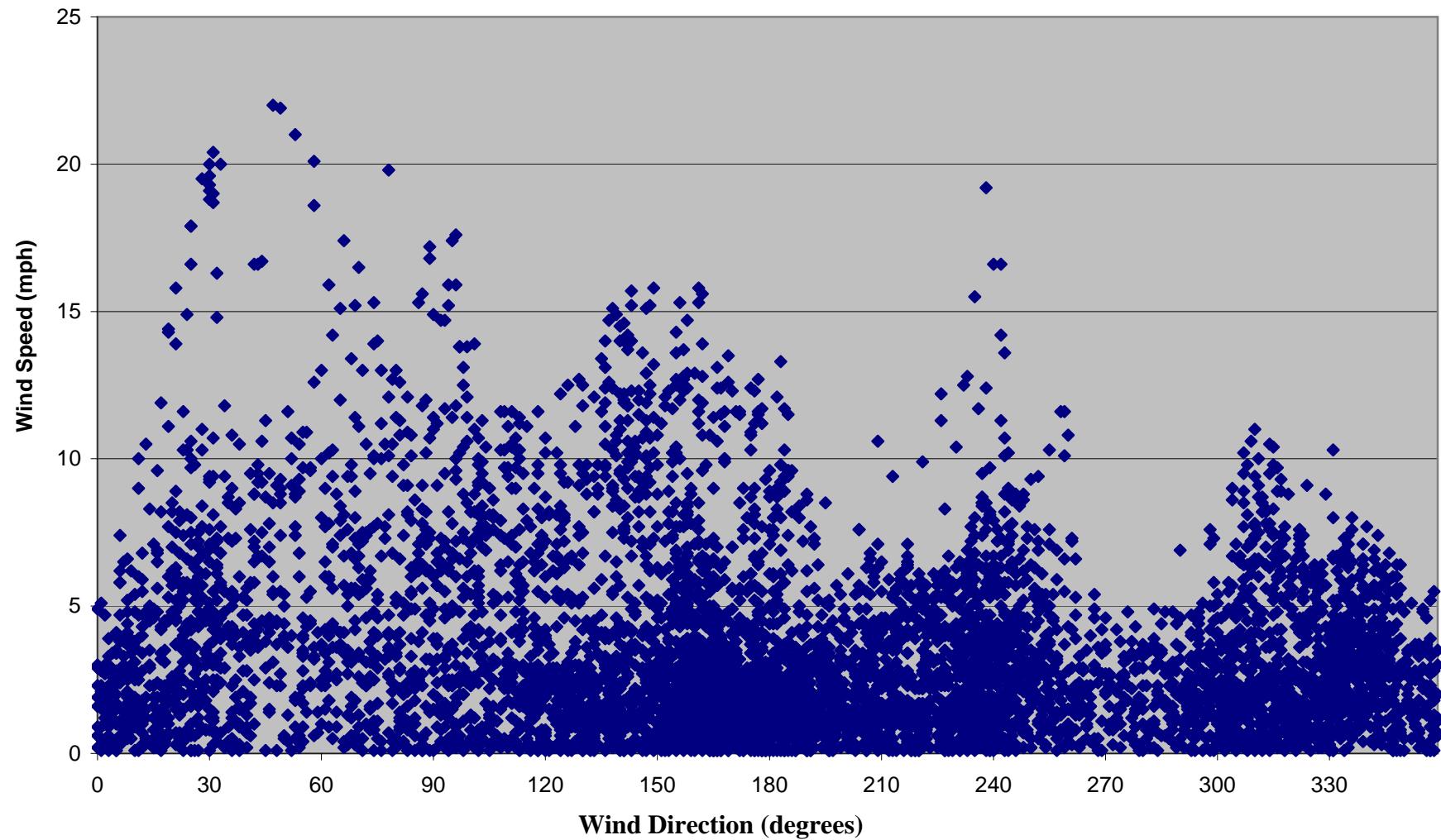
Belmond CAFO: Ammonia vs Wind Direction



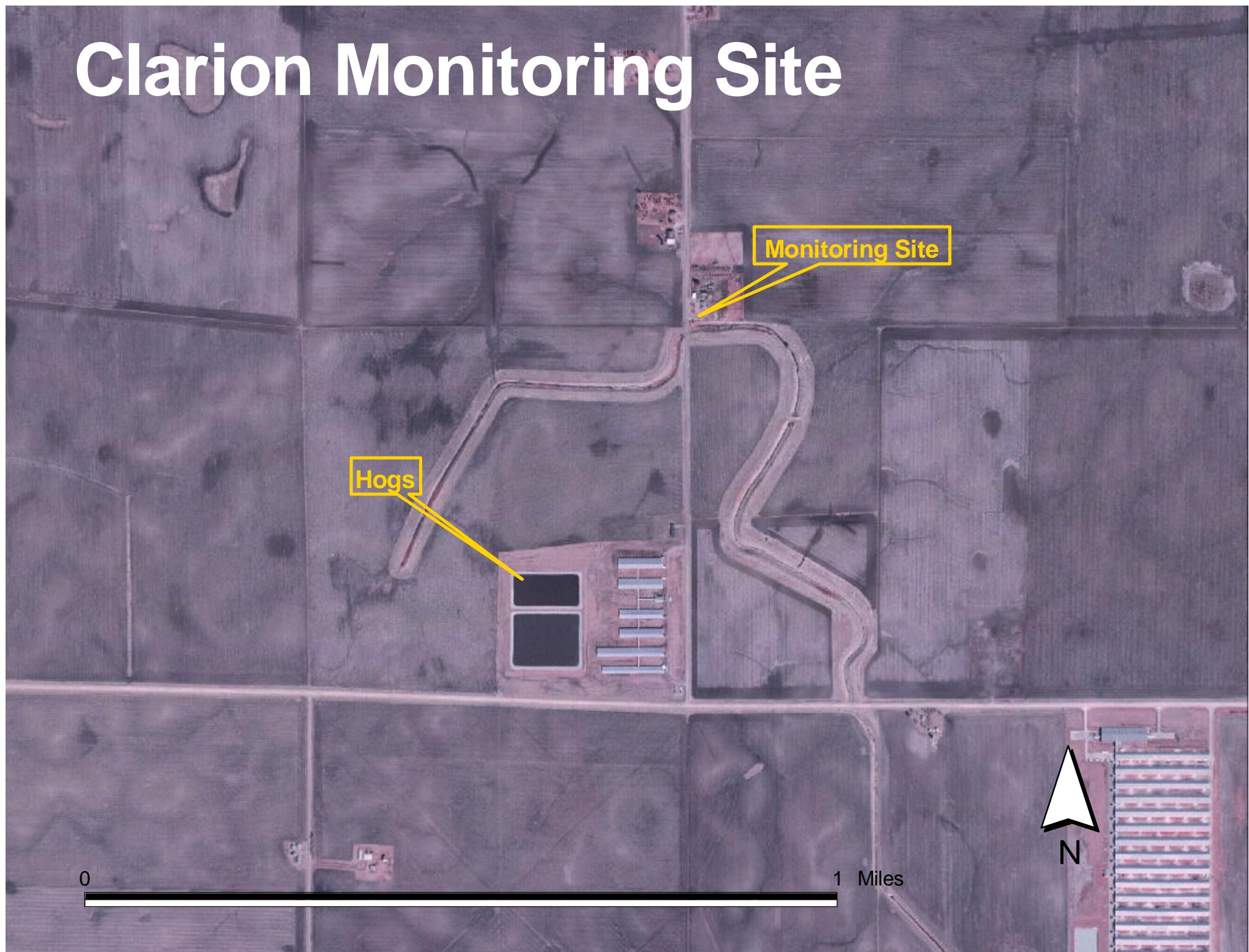
Belmond CAFO-Hydrogen Sulfide vs Wind Direction



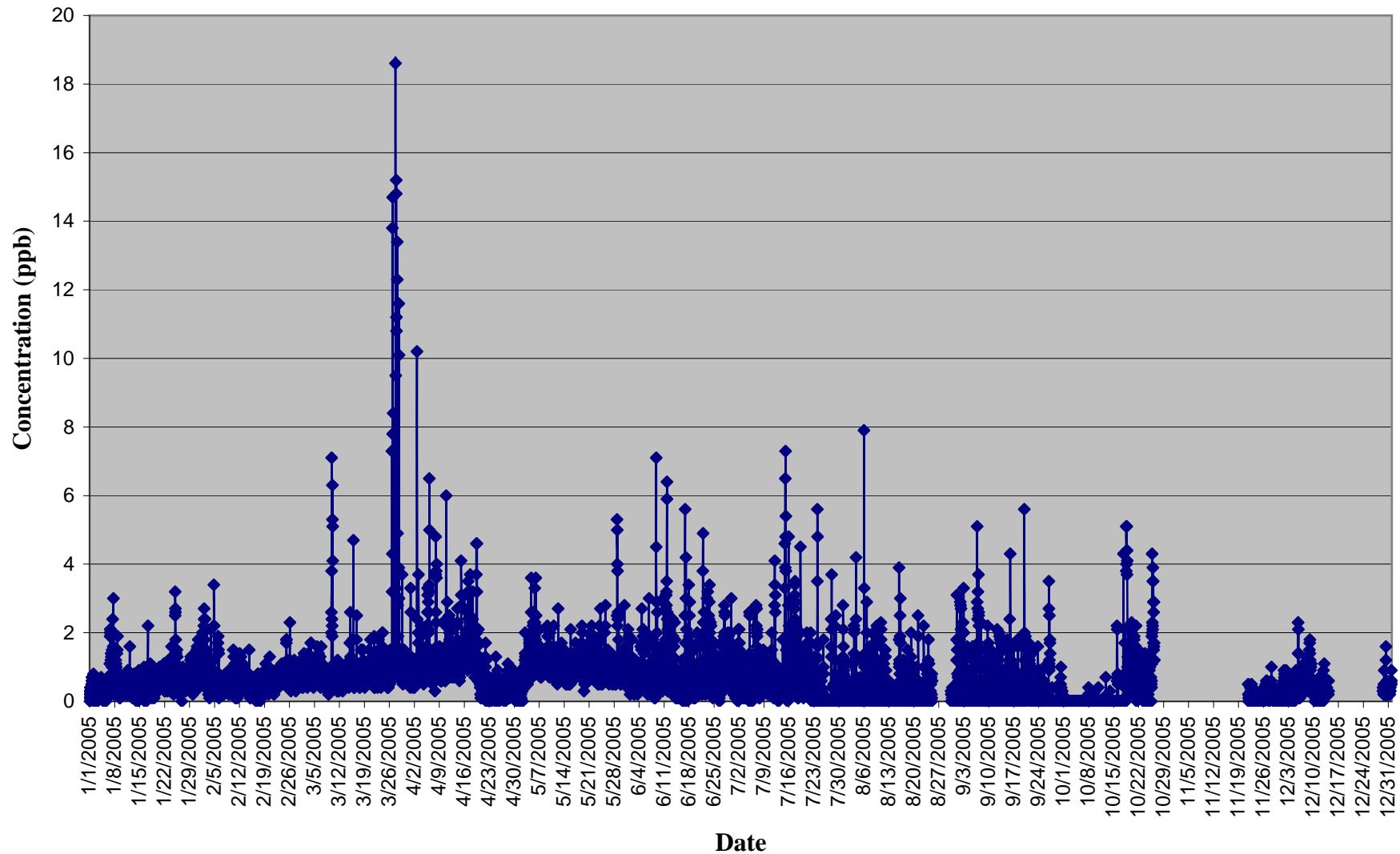
Belmond CAFO: Wind Speed vs Wind Direction



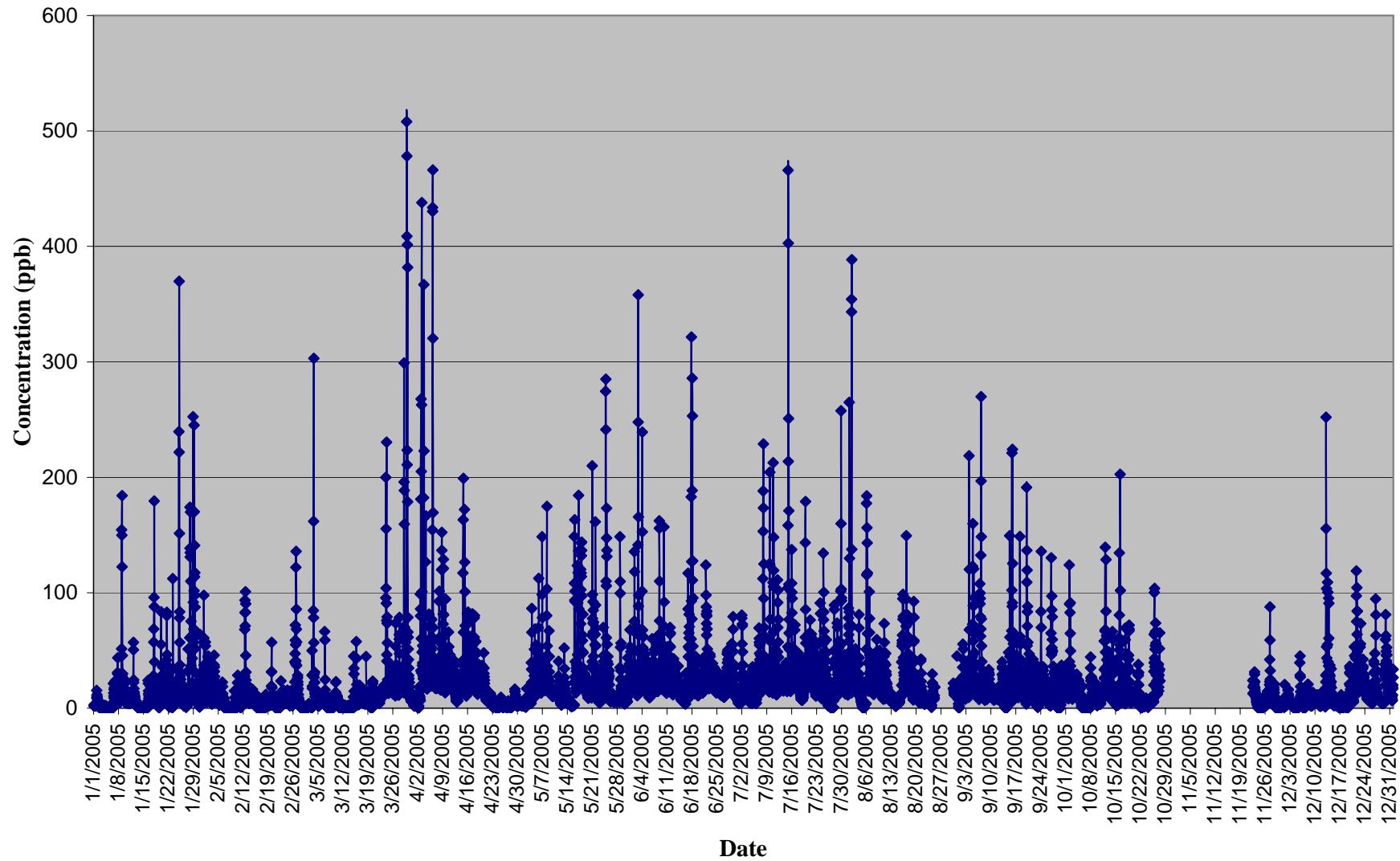
Clarion Monitoring Site



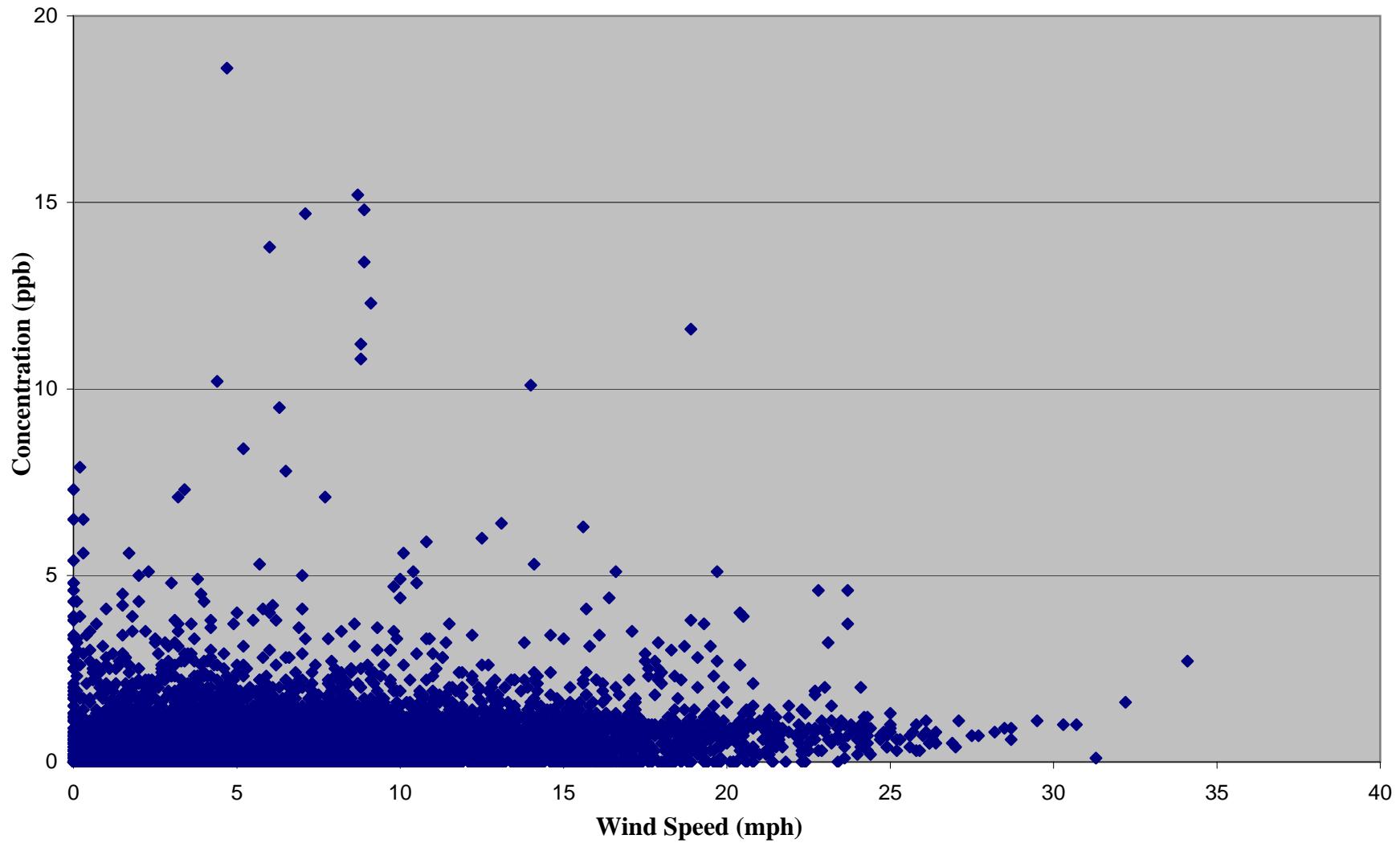
Clarion CAFO: Hydrogen Sulfide vs Time



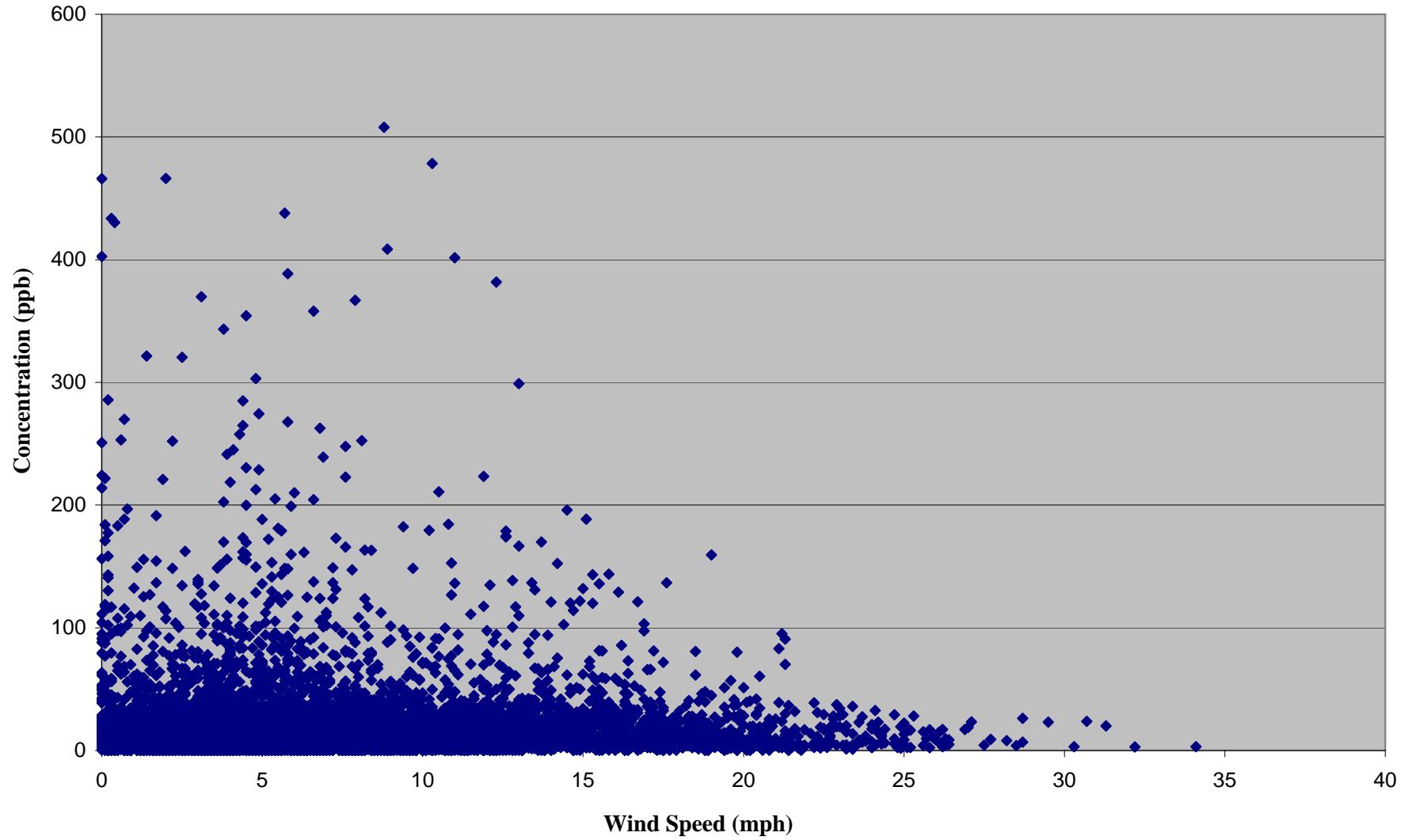
Clarion CAFO: Ammonia vs Time



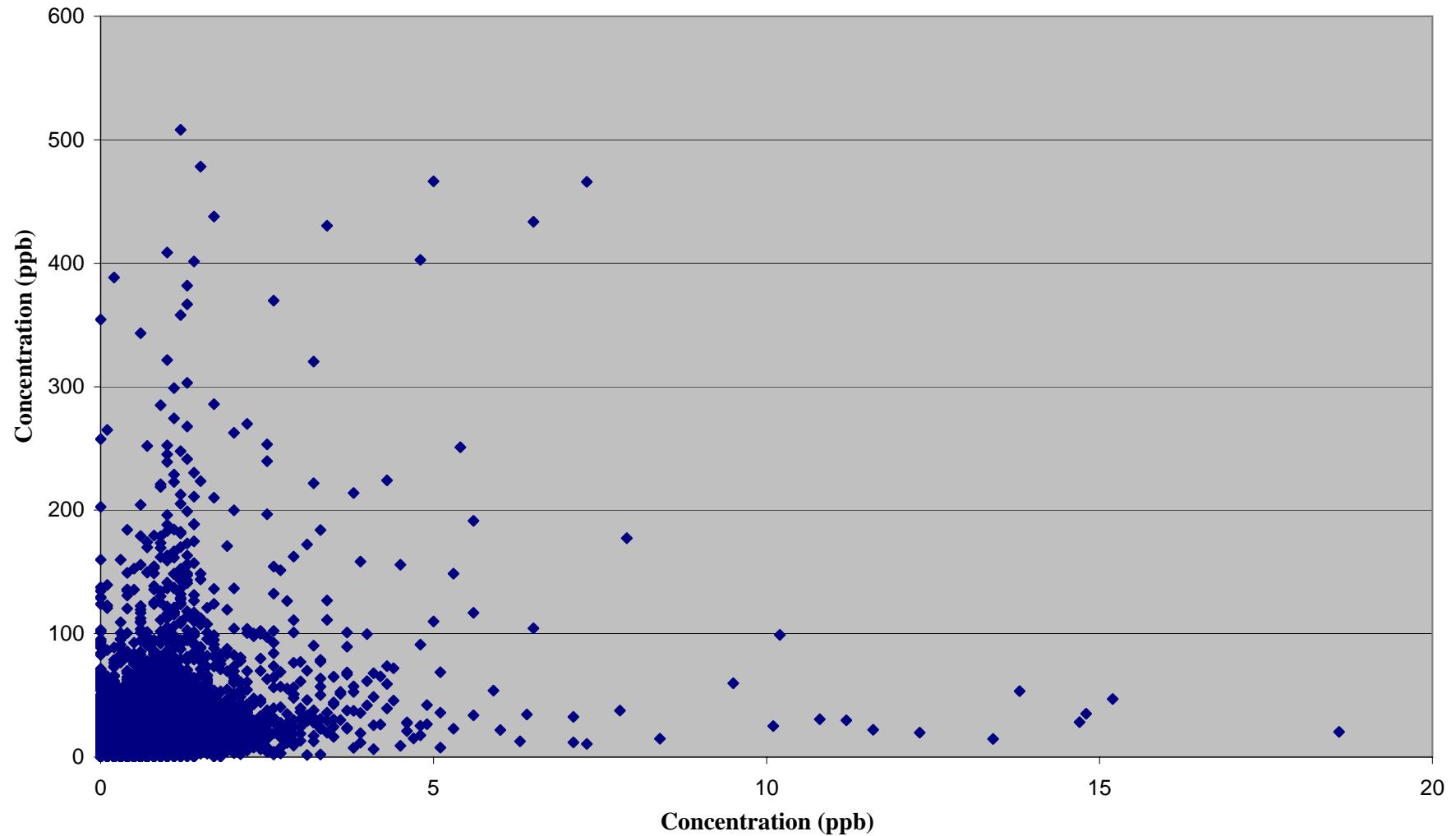
Clarion CAFO: Hydrogen Sulfide vs Wind Speed



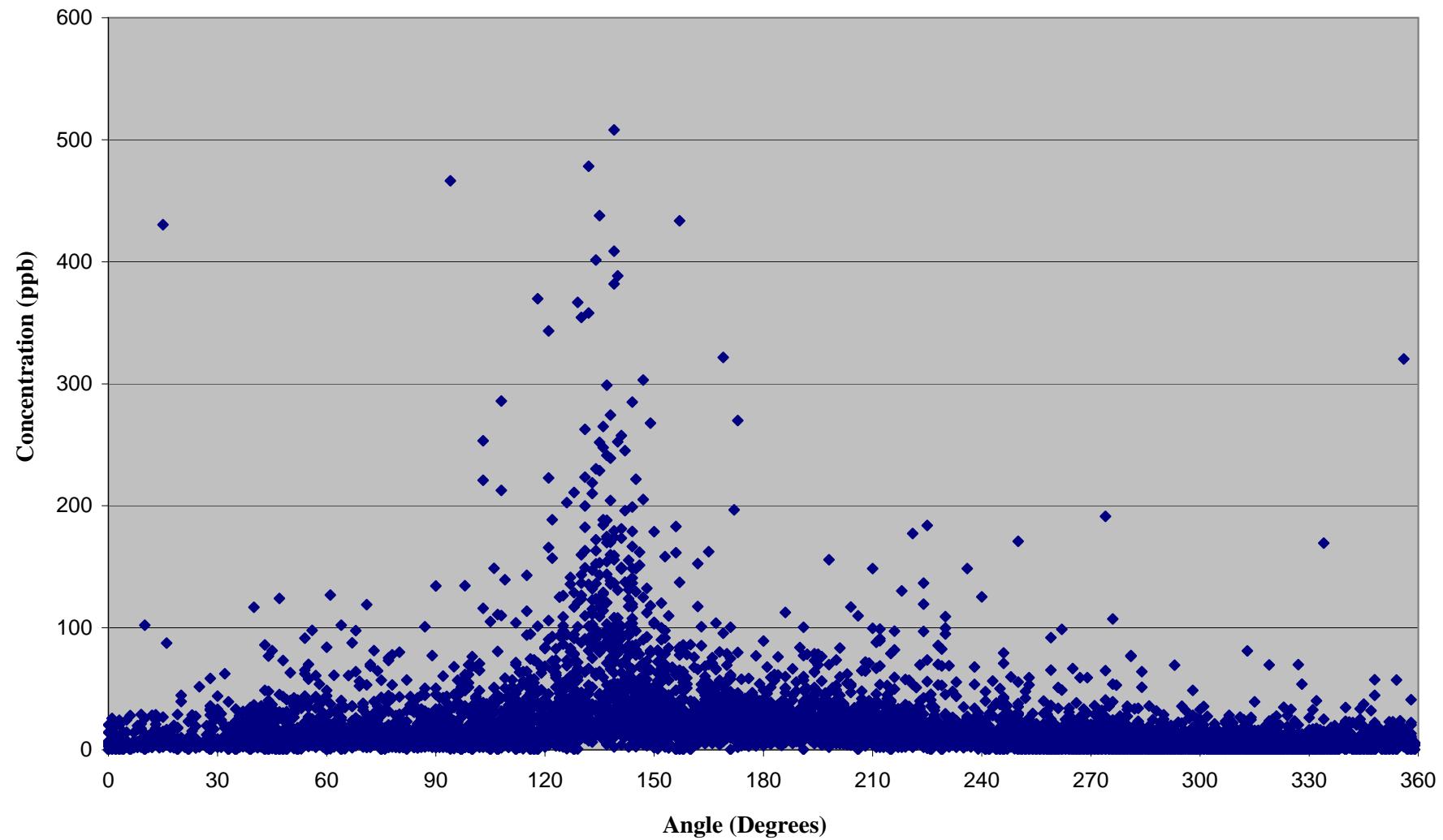
Clarion CAFO: Ammonia vs Wind Speed



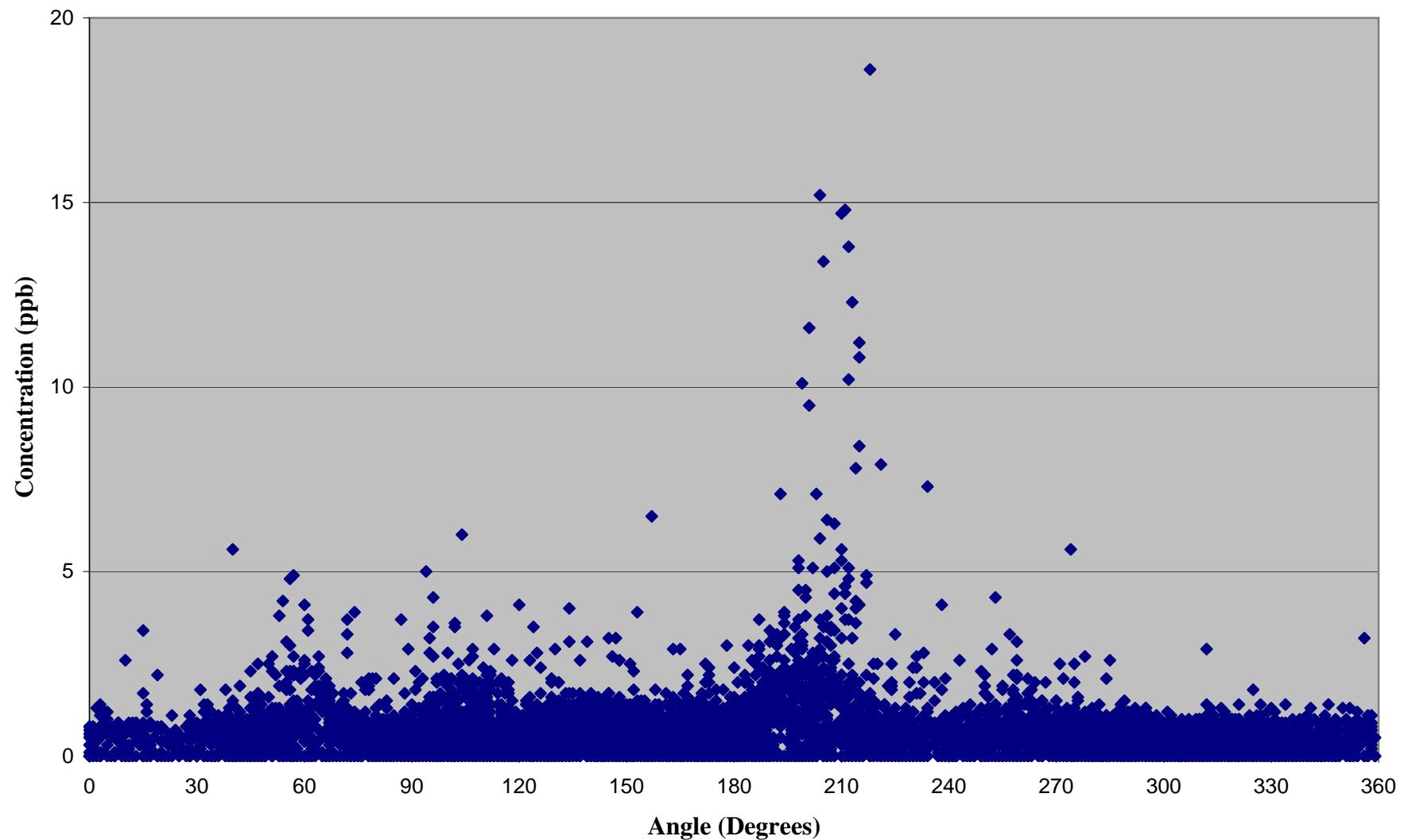
Clarion CAFO: Ammonia vs Hydrogen Sulfide



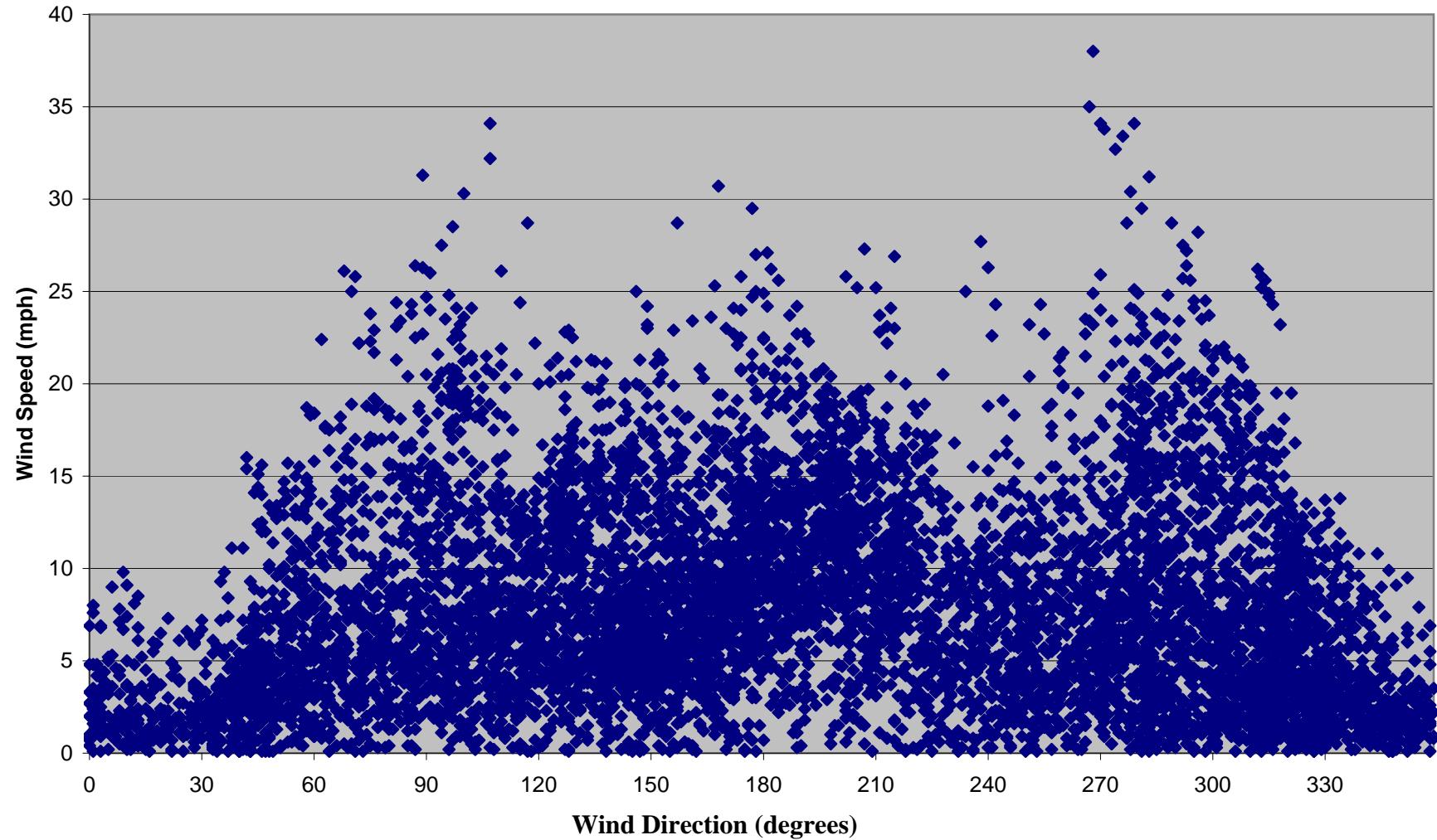
Clarion CAFO: Ammonia vs Wind Direction



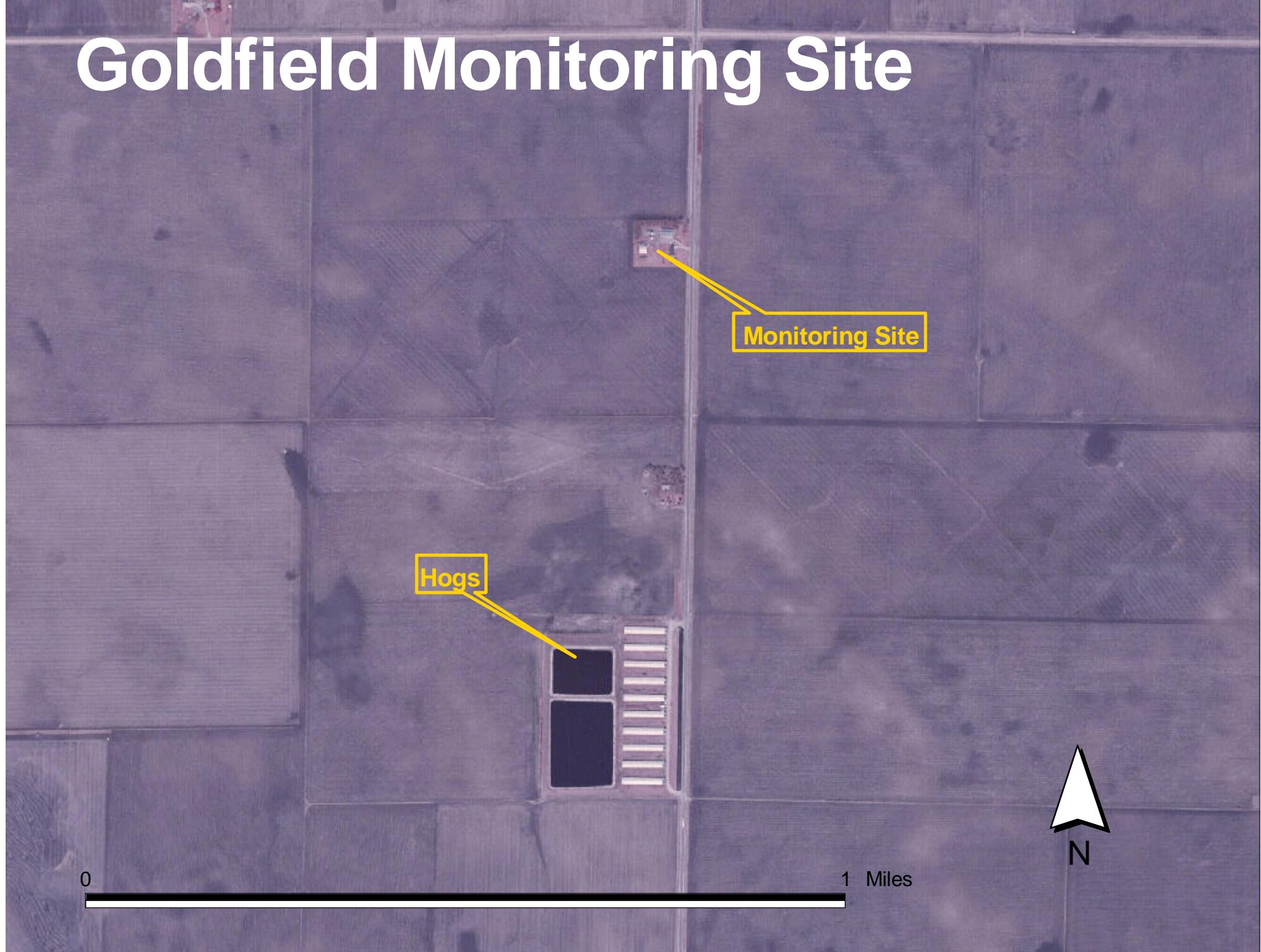
Clarion CAFO-Hydrogen Sulfide vs Wind Direction



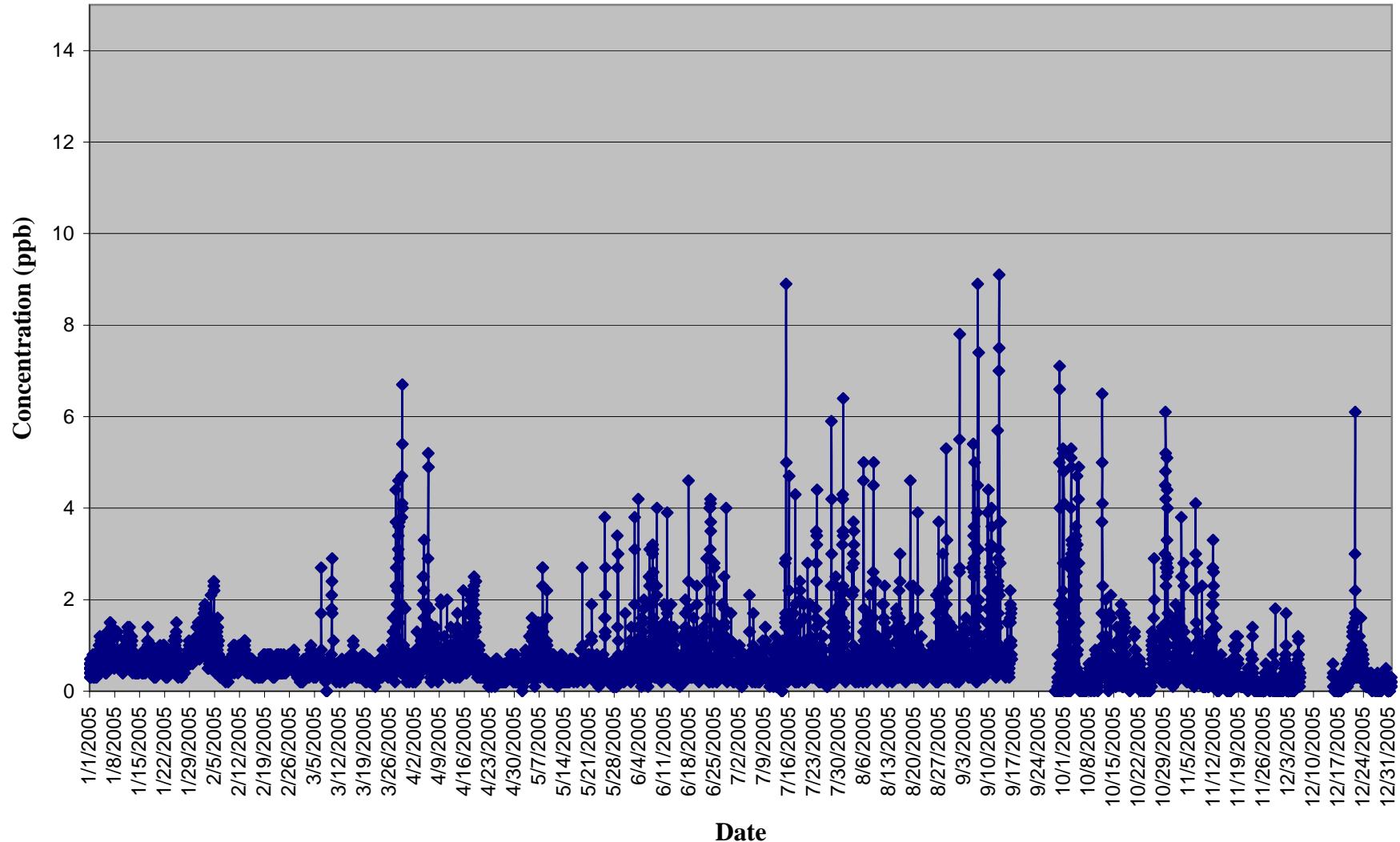
Clarion CAFO: Wind Speed vs Wind Direction



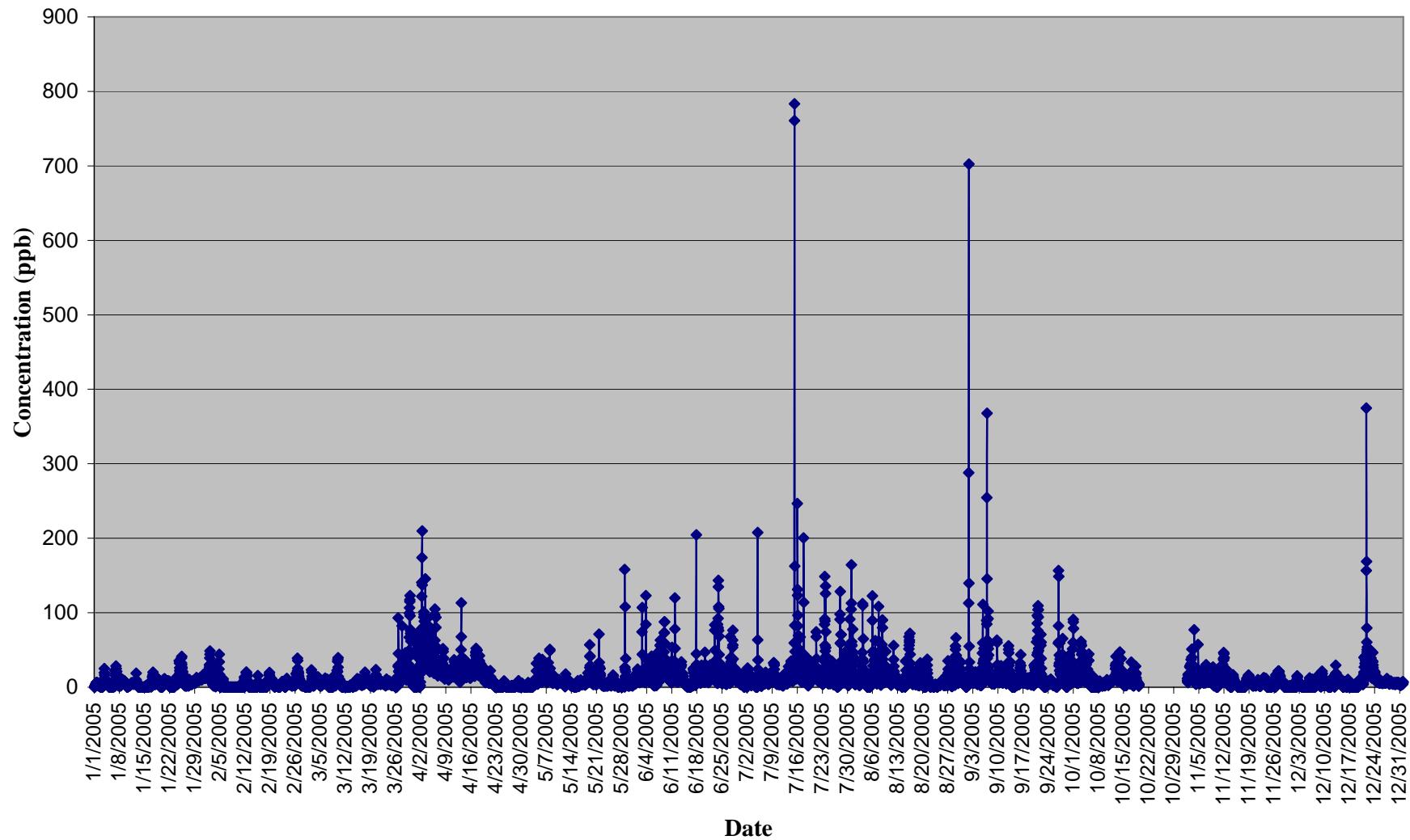
Goldfield Monitoring Site



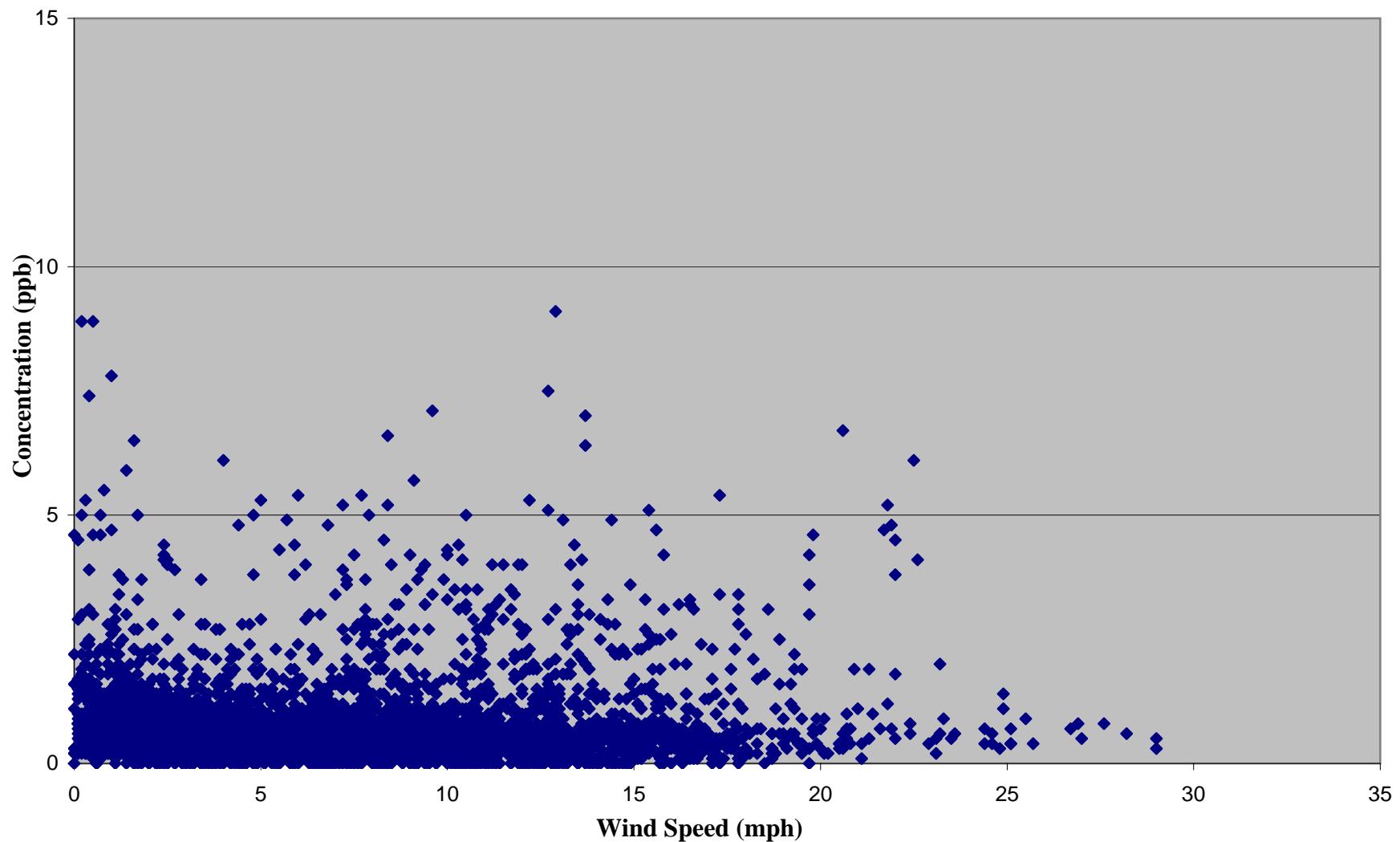
Goldfield CAFO: Hydrogen Sulfide vs Time



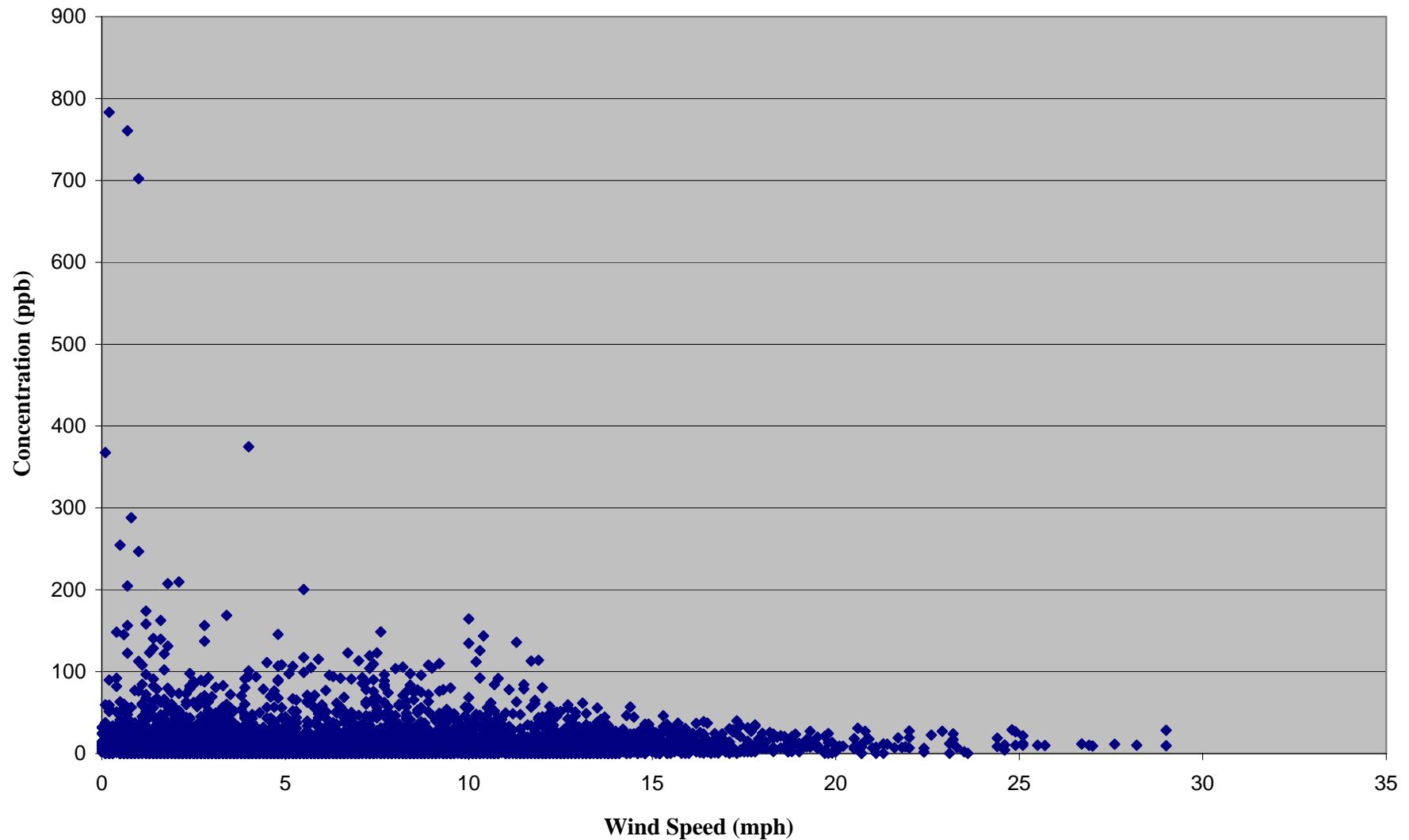
Goldfield CAFO: Ammonia vs Time



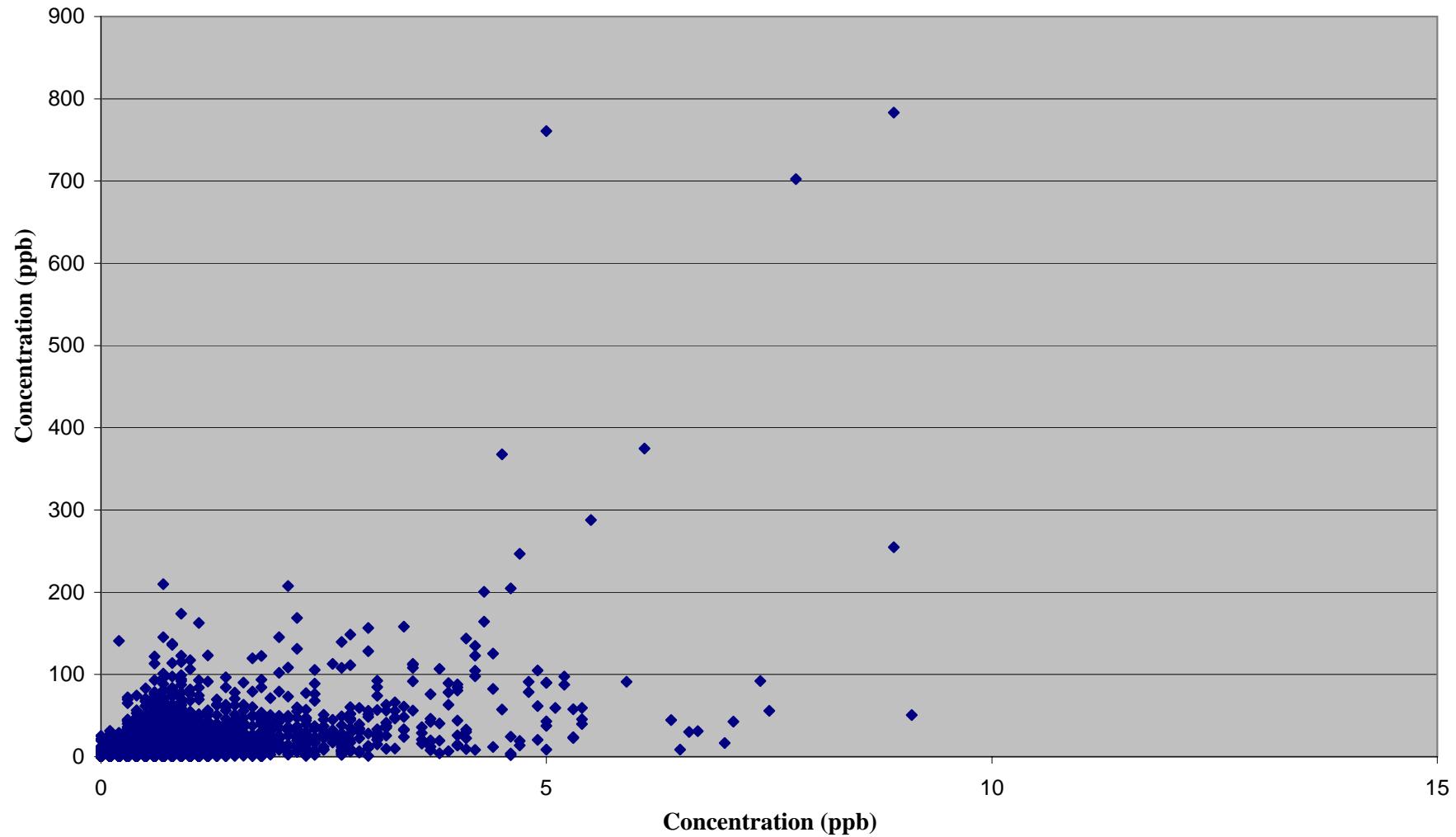
Goldfield CAFO: Hydrogen Sulfide vs Wind Speed



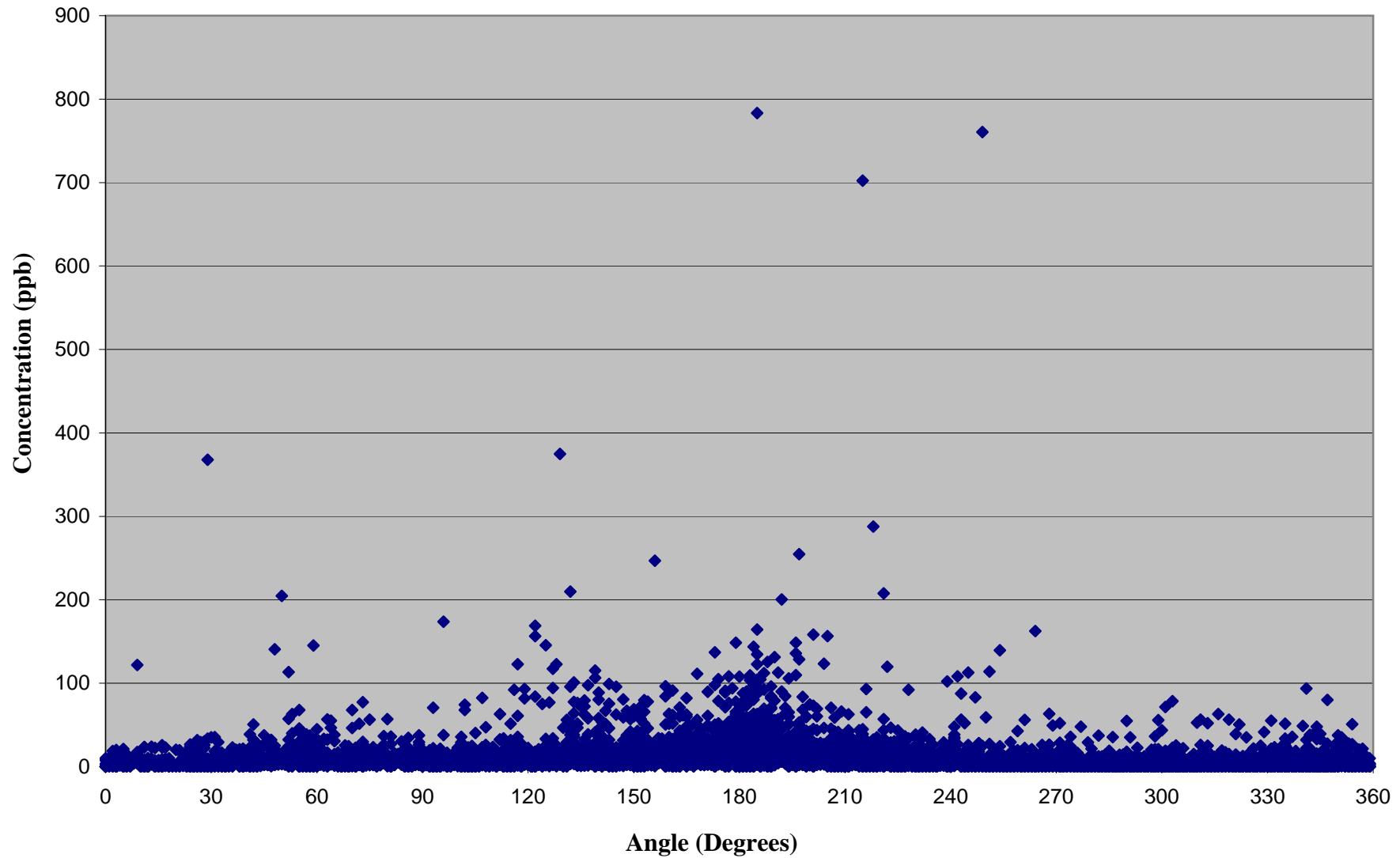
Goldfield CAFO: Ammonia vs Wind Speed



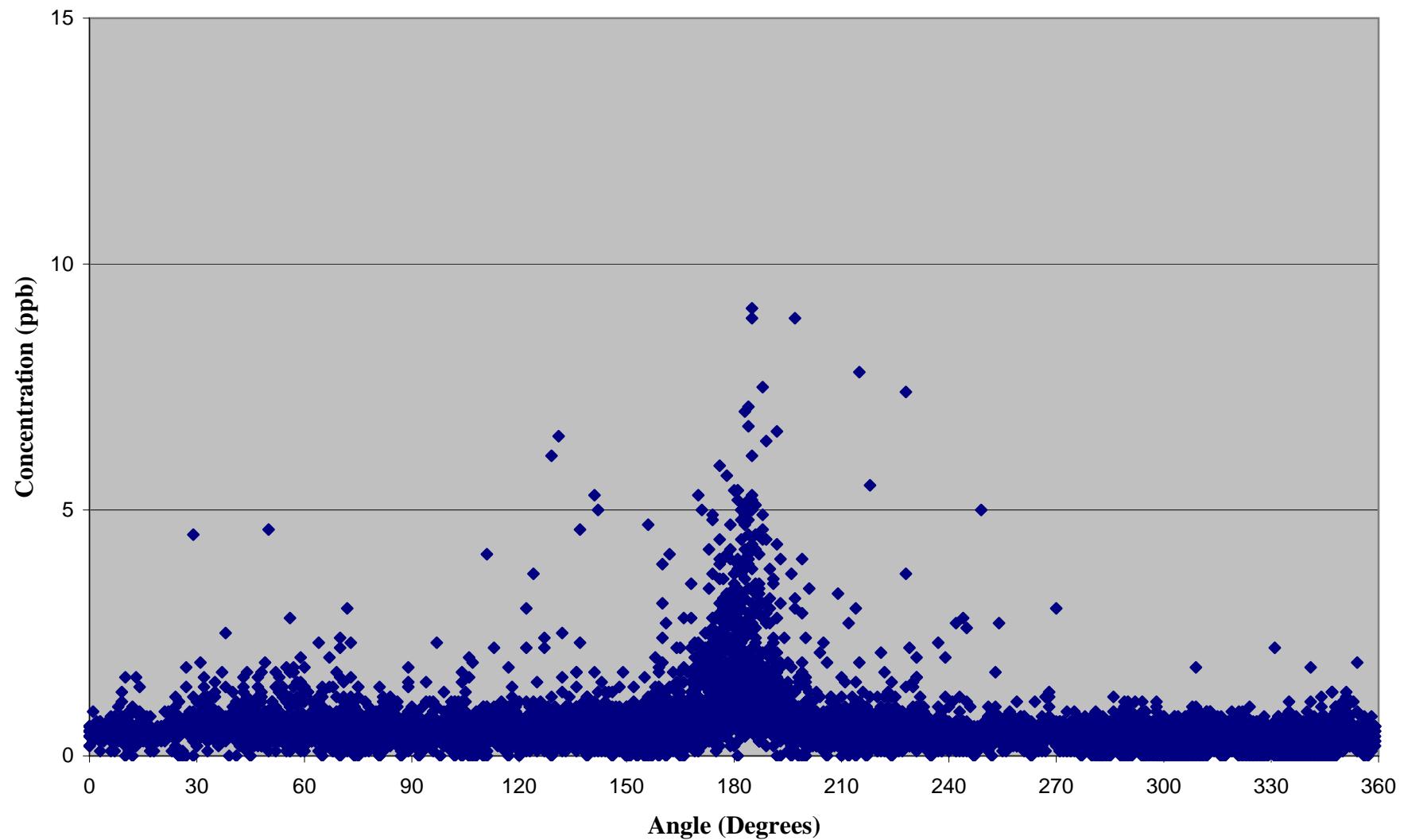
Goldfield CAFO: Ammonia vs Hydrogen Sulfide



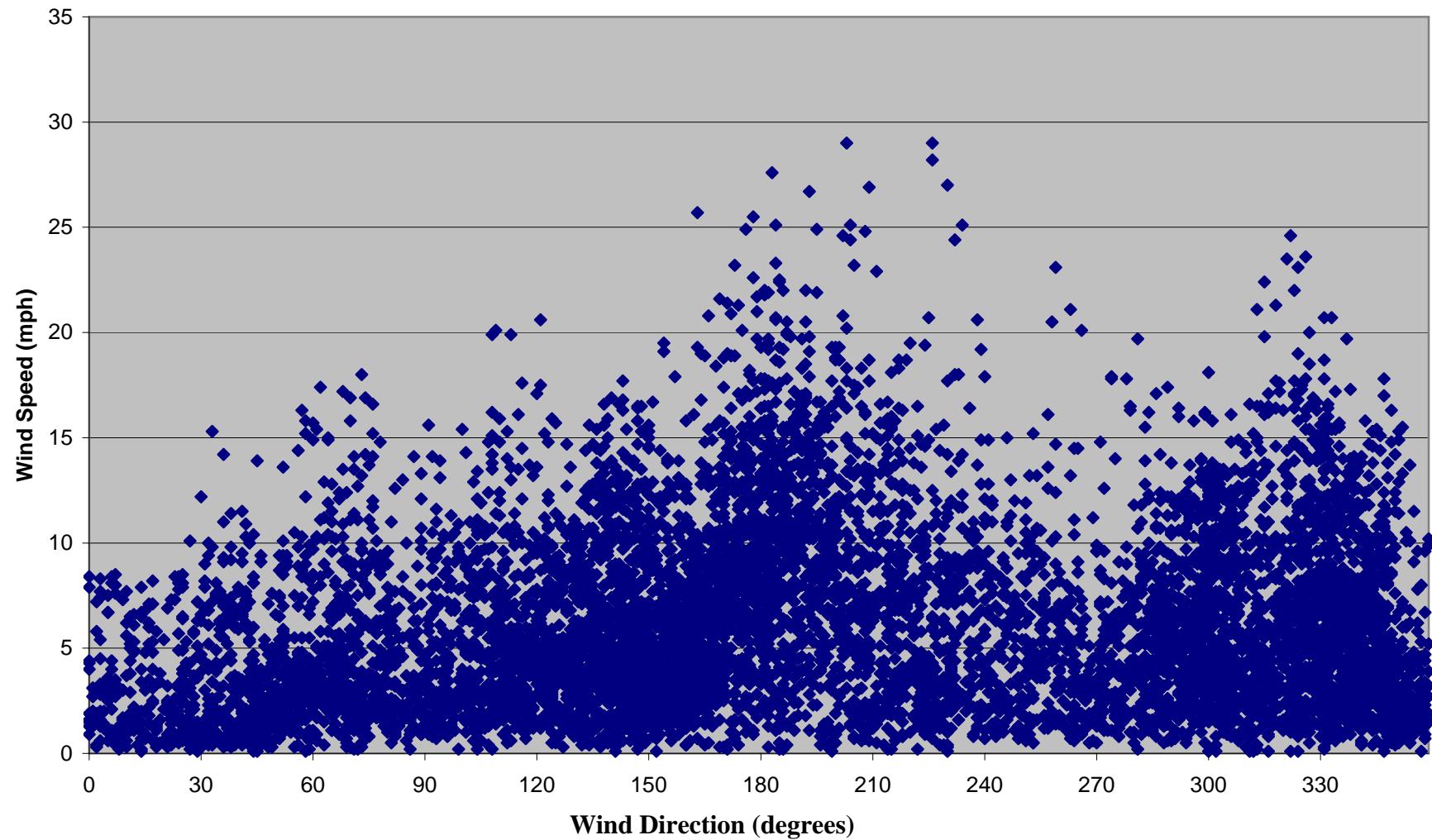
Goldfield CAFO: Ammonia vs Wind Direction



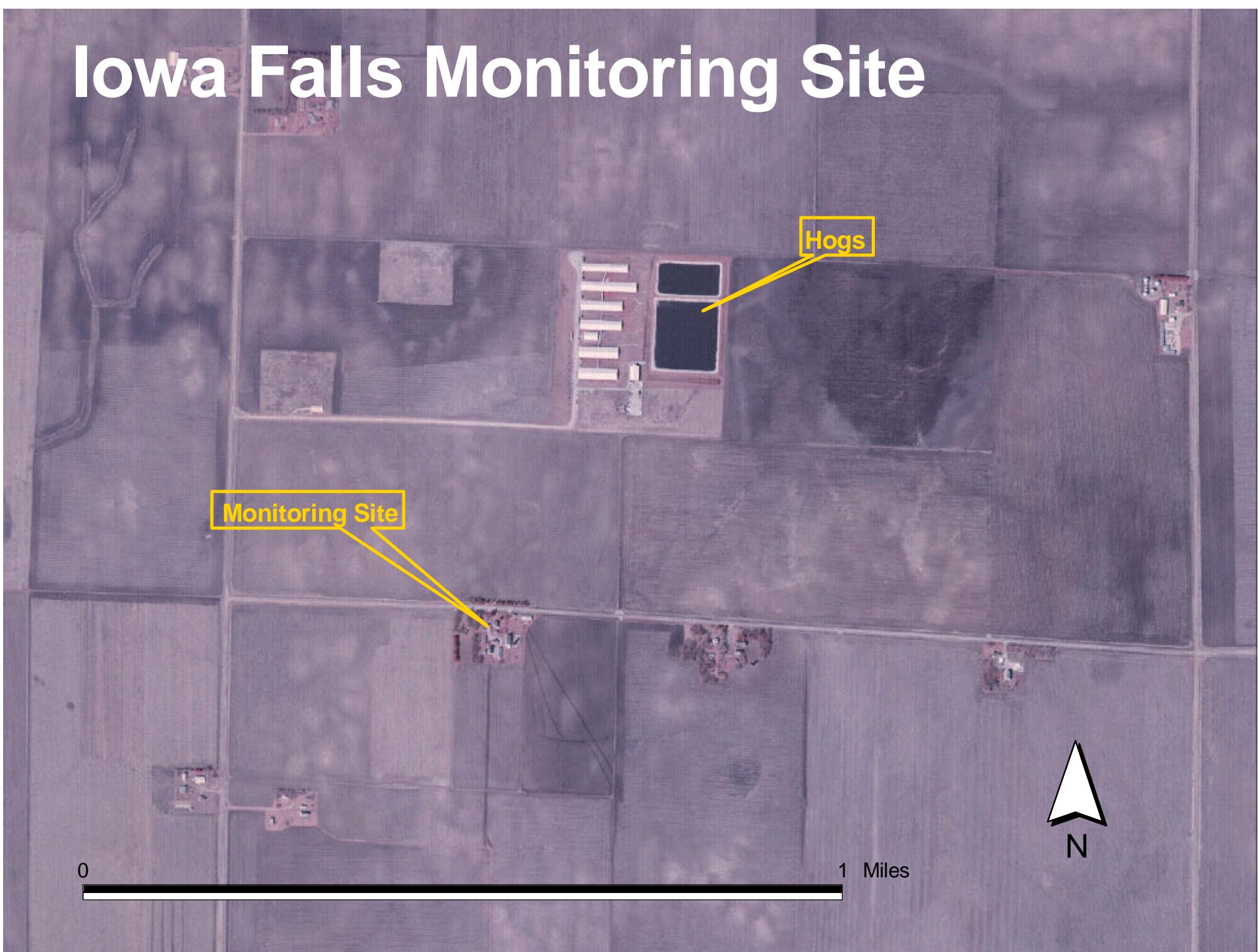
Goldfield CAFO-Hydrogen Sulfide vs Wind Direction



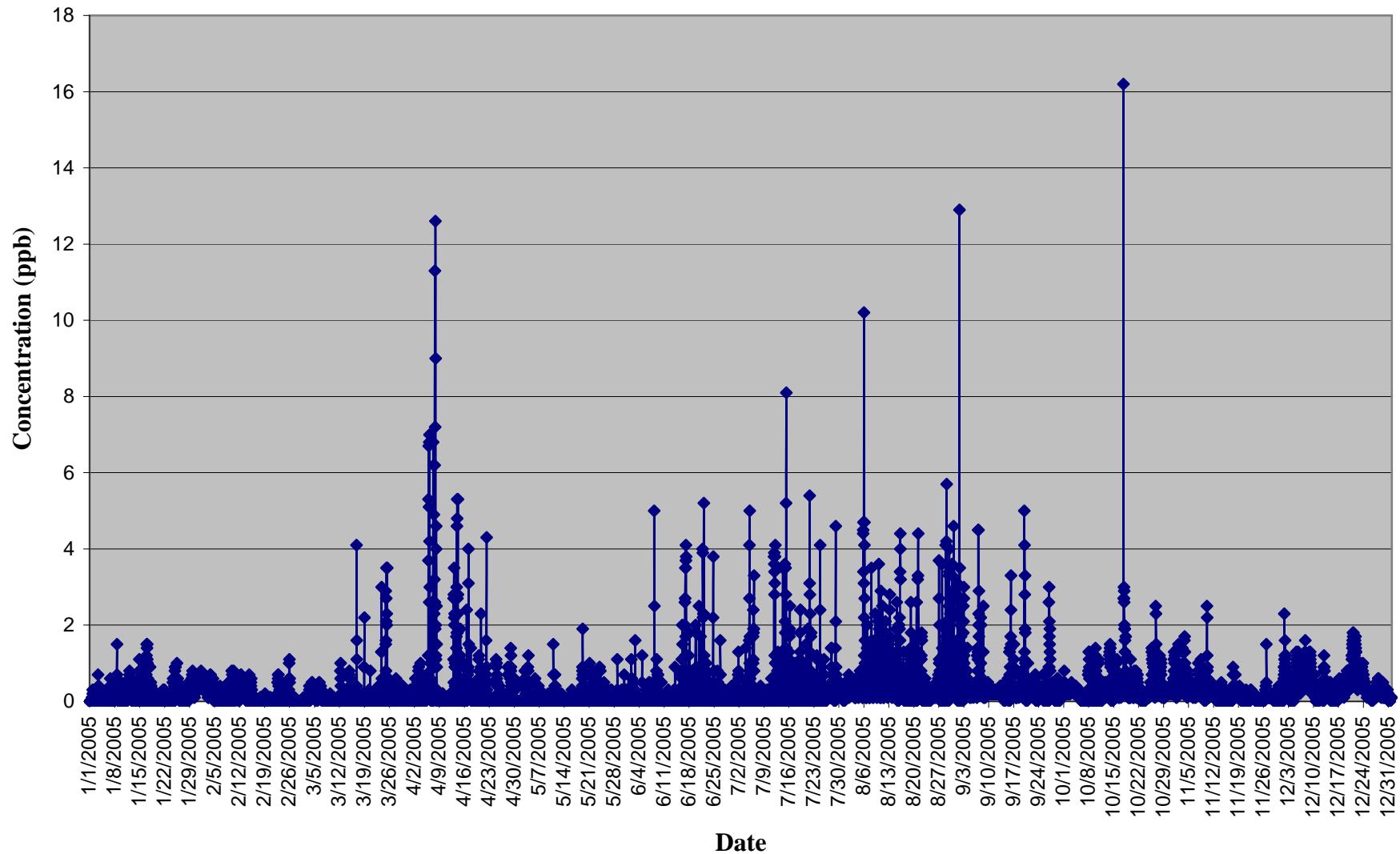
Goldfield CAFO: Wind Speed vs Wind Direction



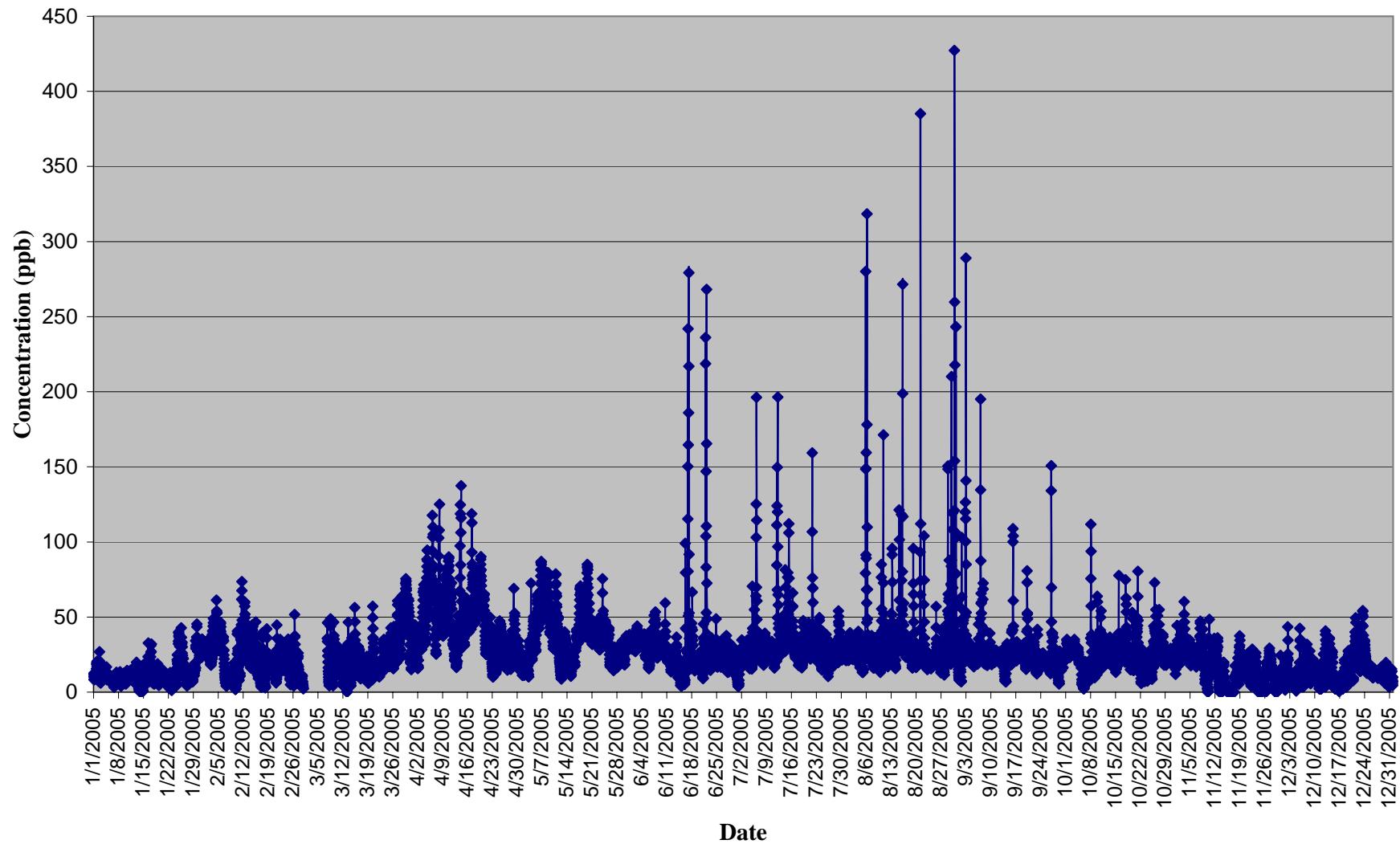
Iowa Falls Monitoring Site



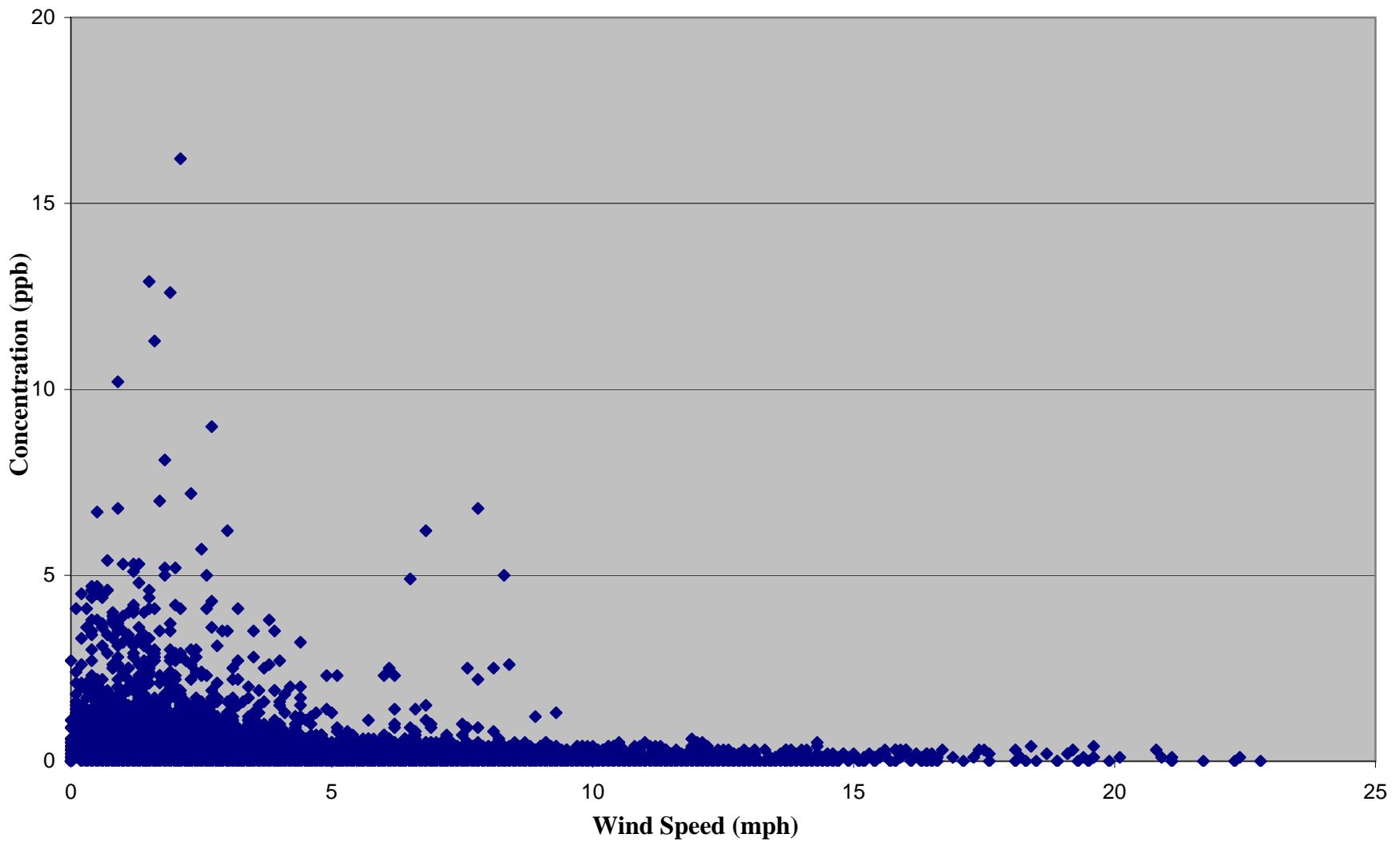
Iowa Falls CAFO: Hydrogen Sulfide vs Time



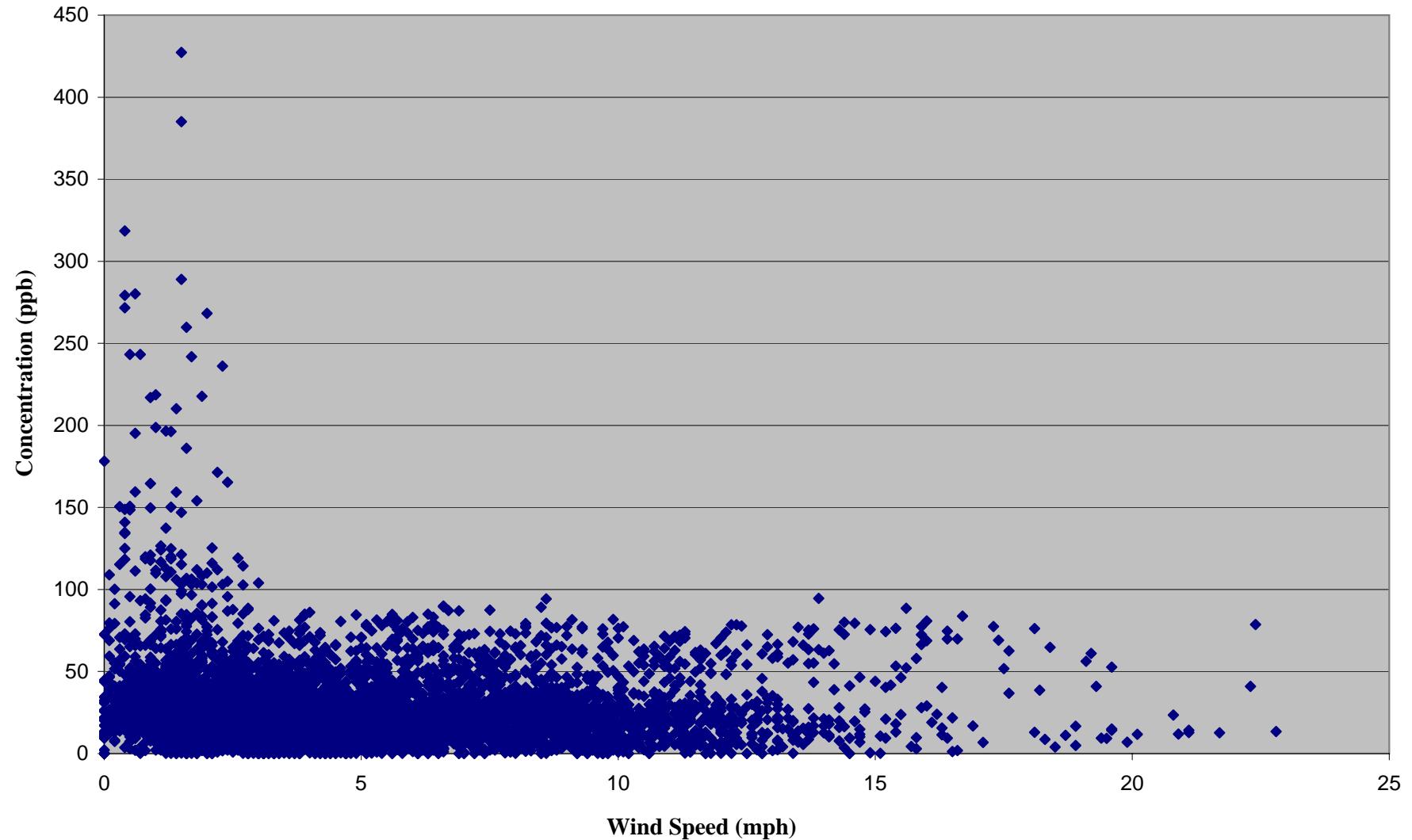
Iowa Falls CAFO: Ammonia vs Time



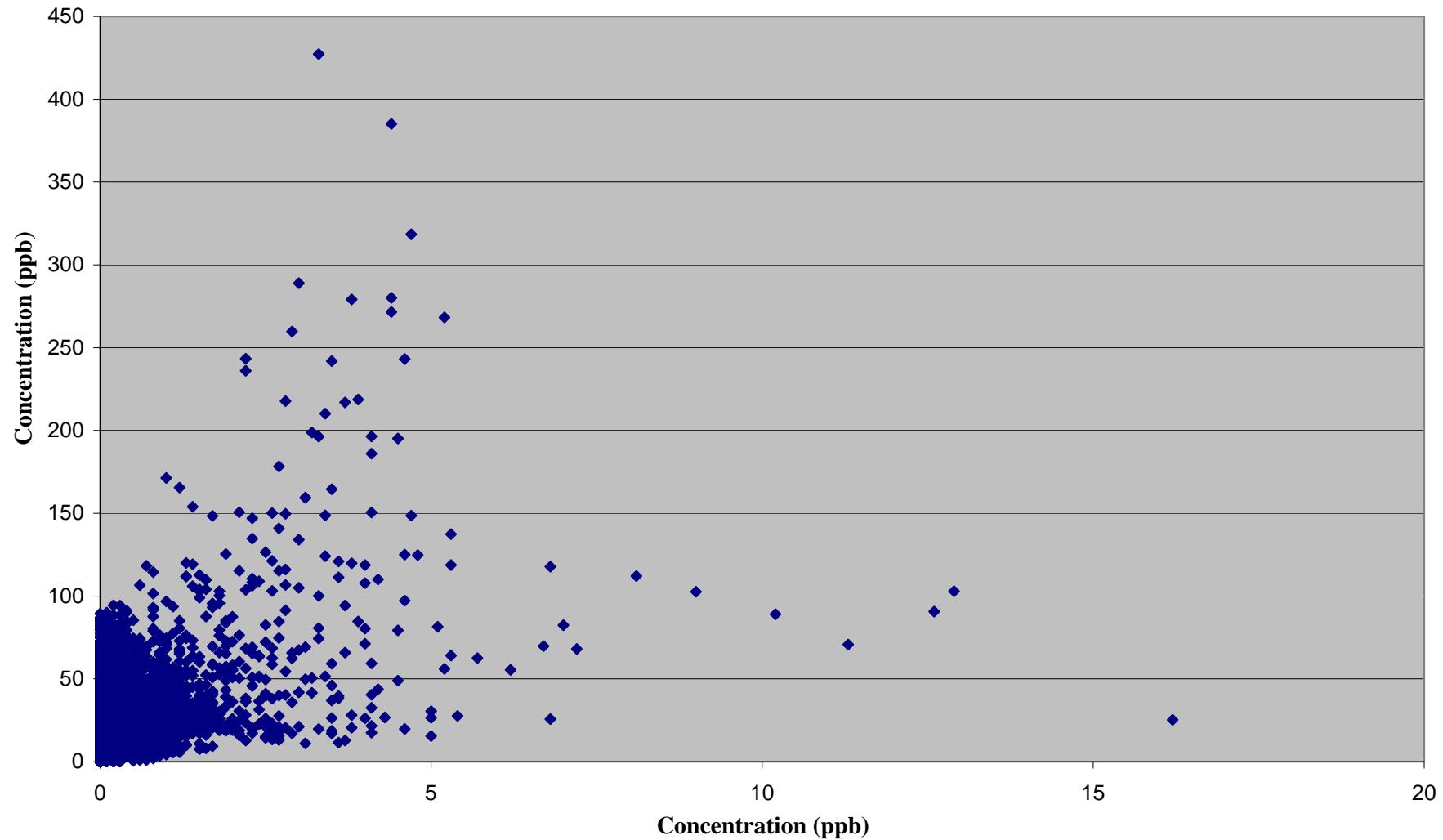
Iowa Falls CAFO: Hydrogen Sulfide vs Wind Speed



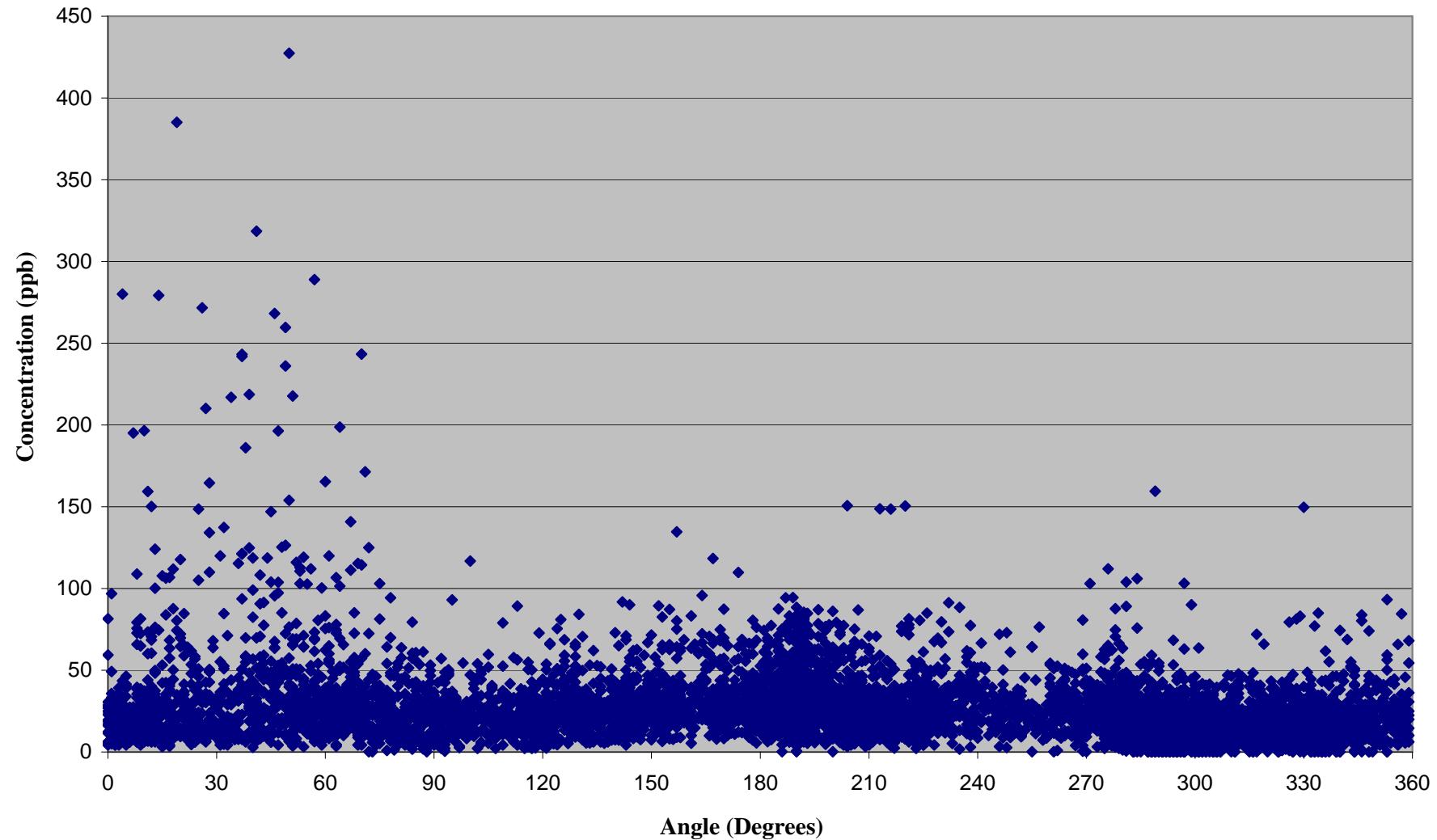
Iowa Falls CAFO: Ammonia vs Wind Speed



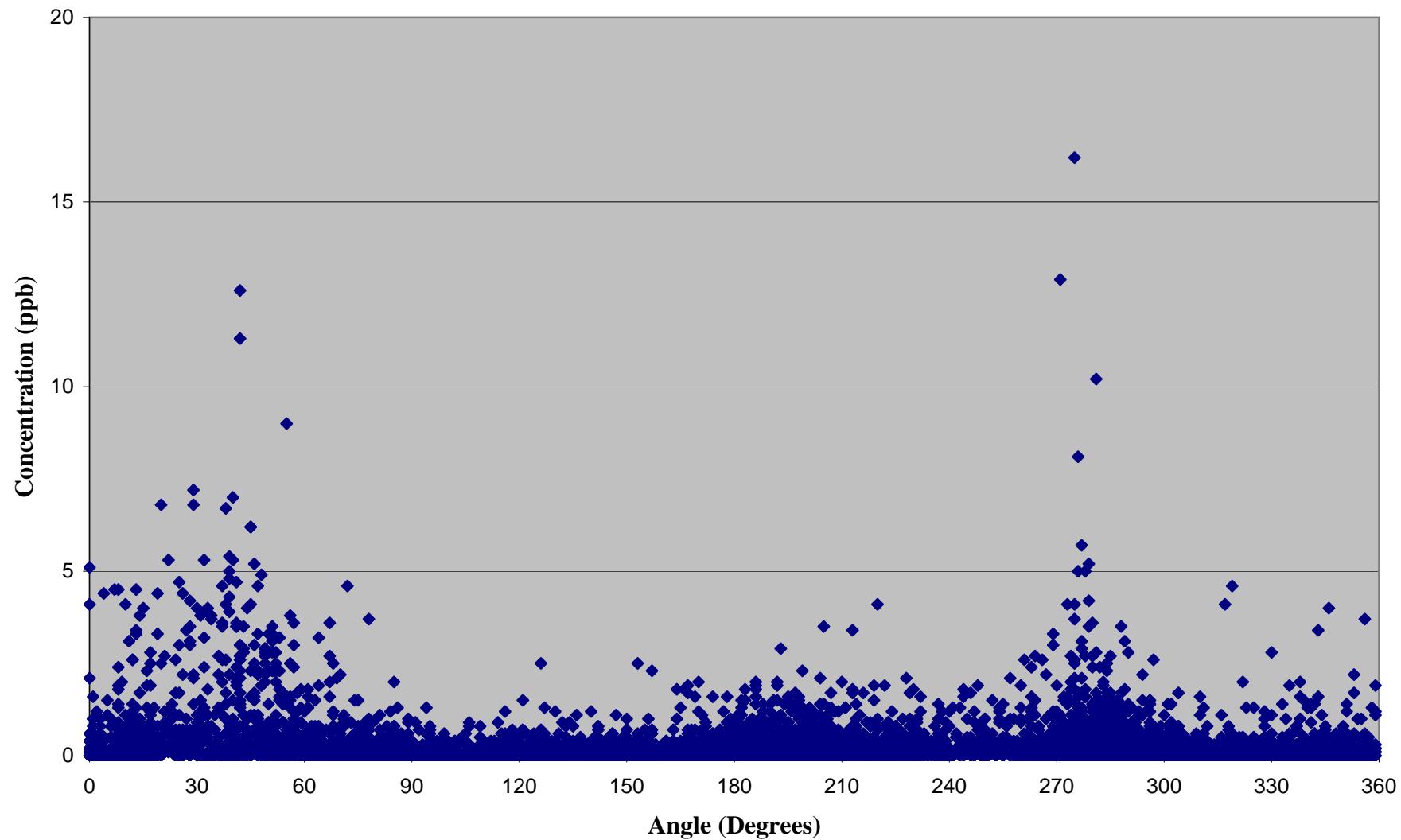
Iowa Falls CAFO: Ammonia vs Hydrogen Sulfide



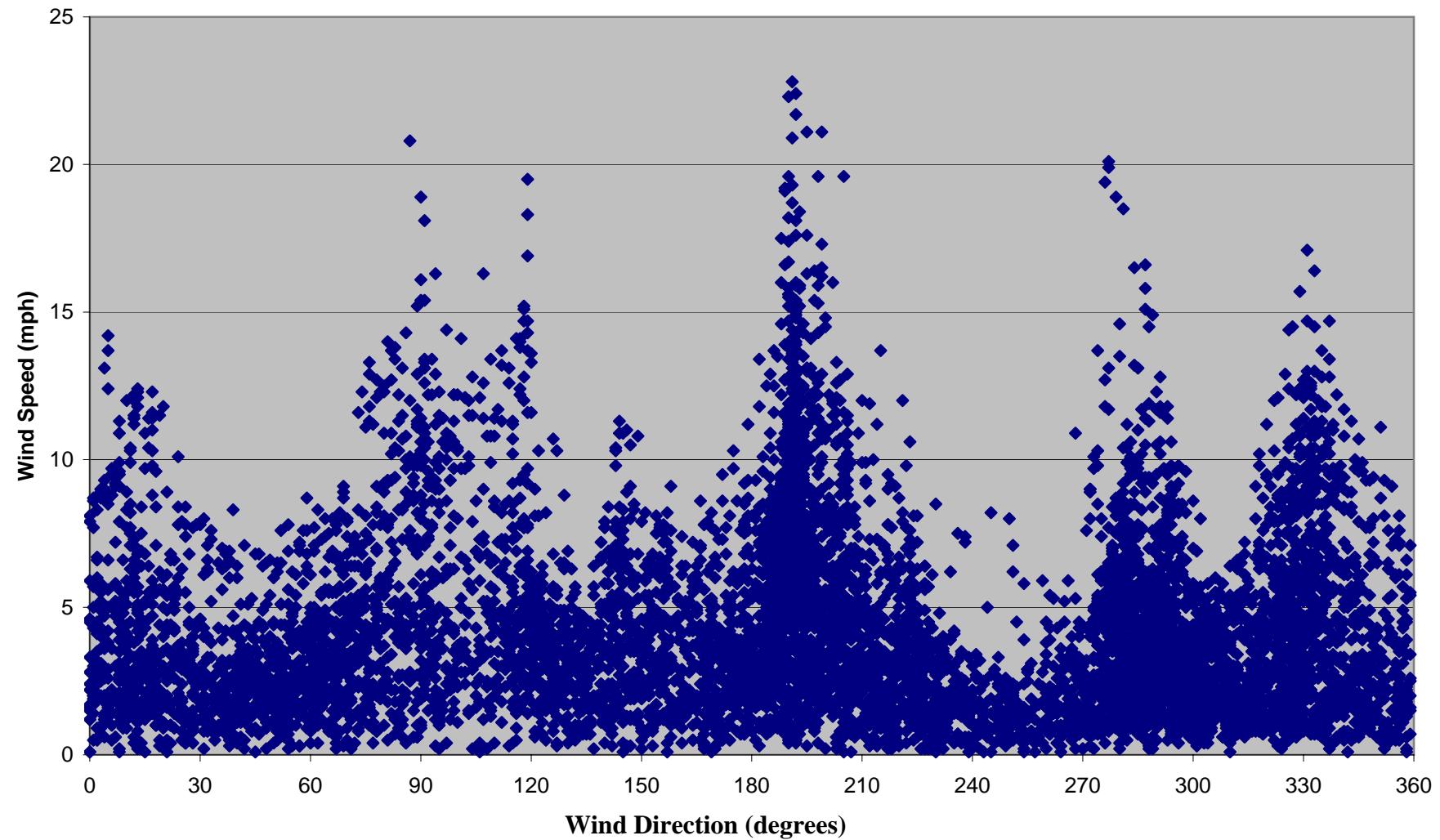
Iowa Falls CAFO: Ammonia vs Wind Direction



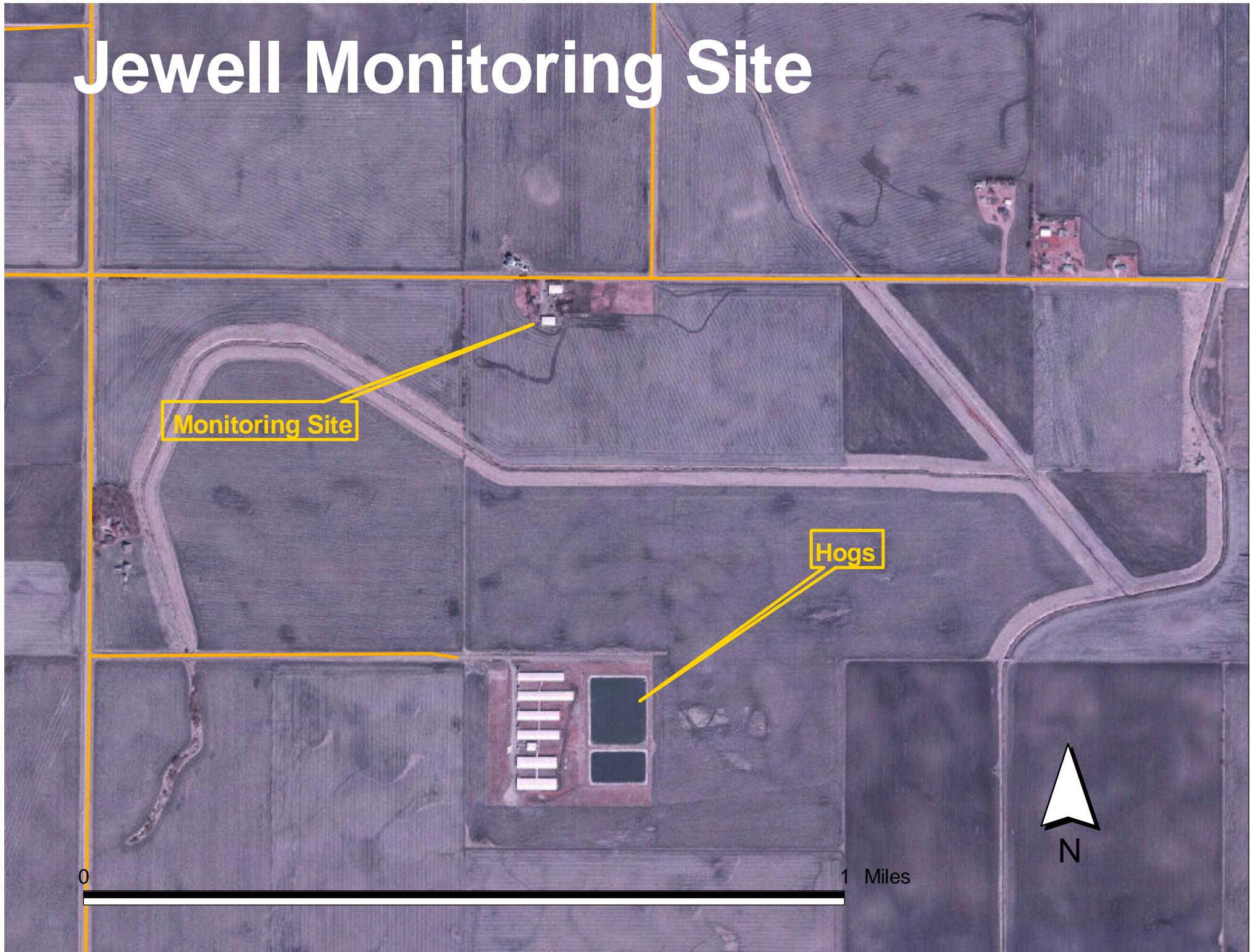
Iowa Falls CAFO-Hydrogen Sulfide vs Wind Direction



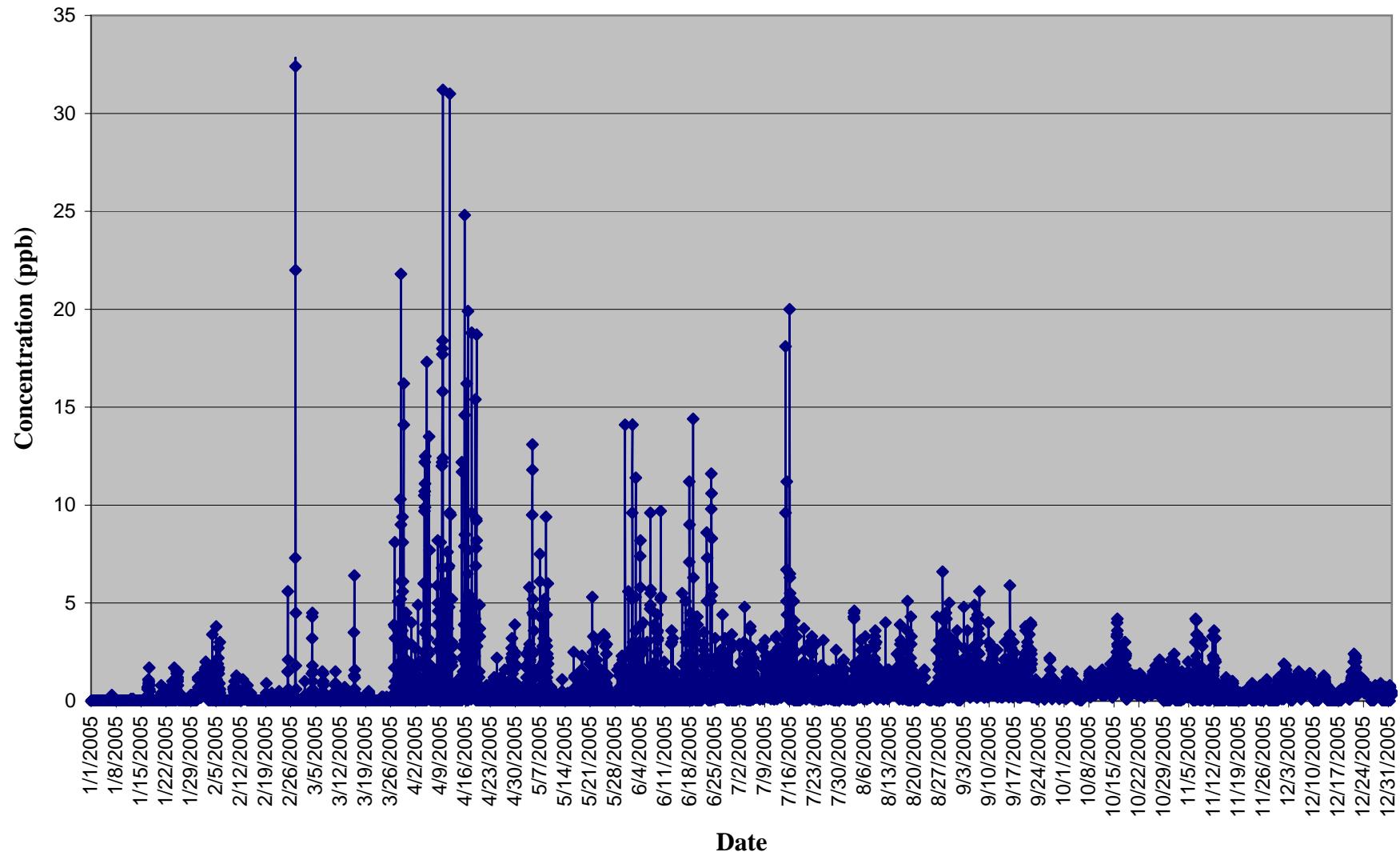
Iowa Falls CAFO: Wind Speed vs Wind Direction



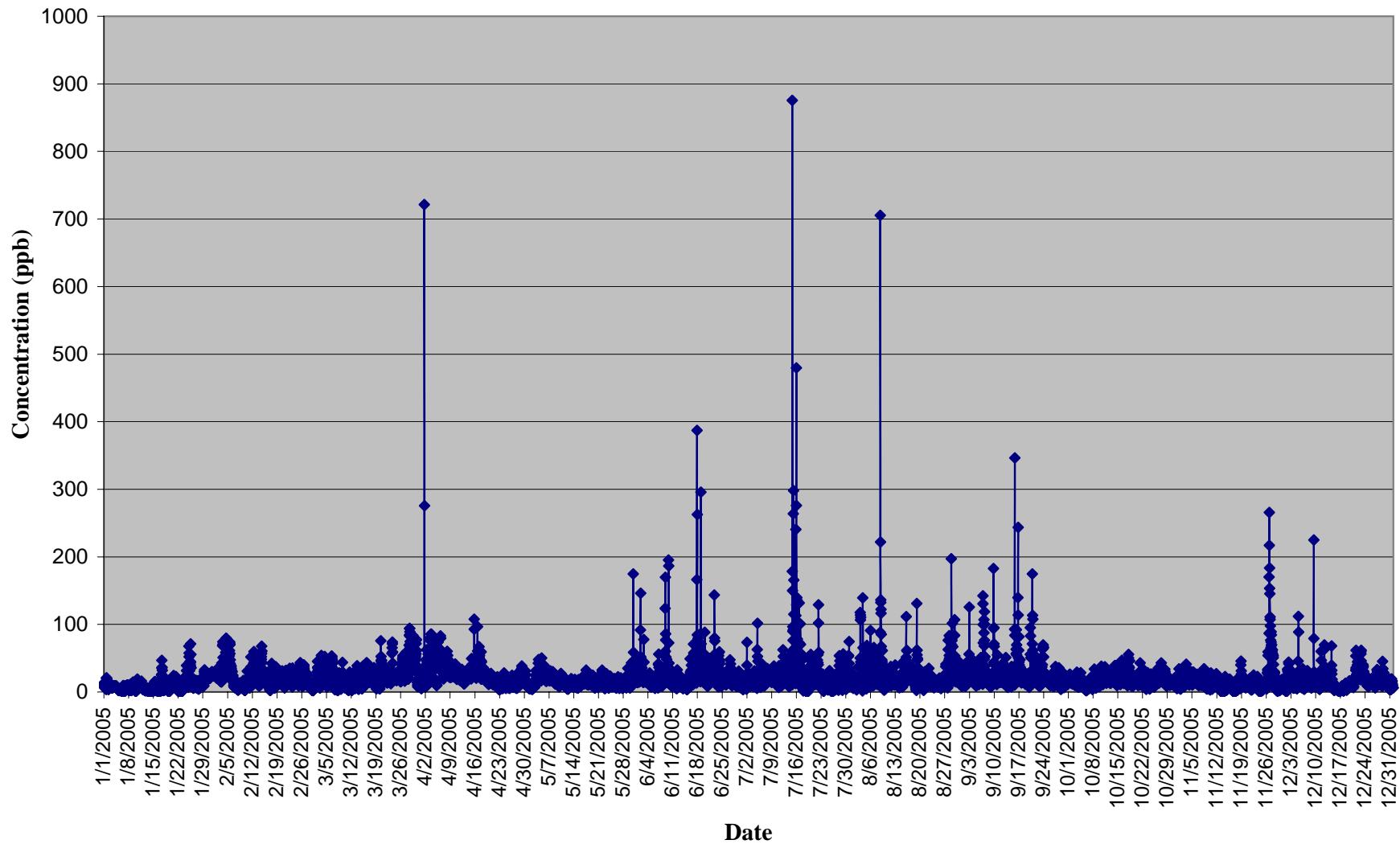
Jewell Monitoring Site



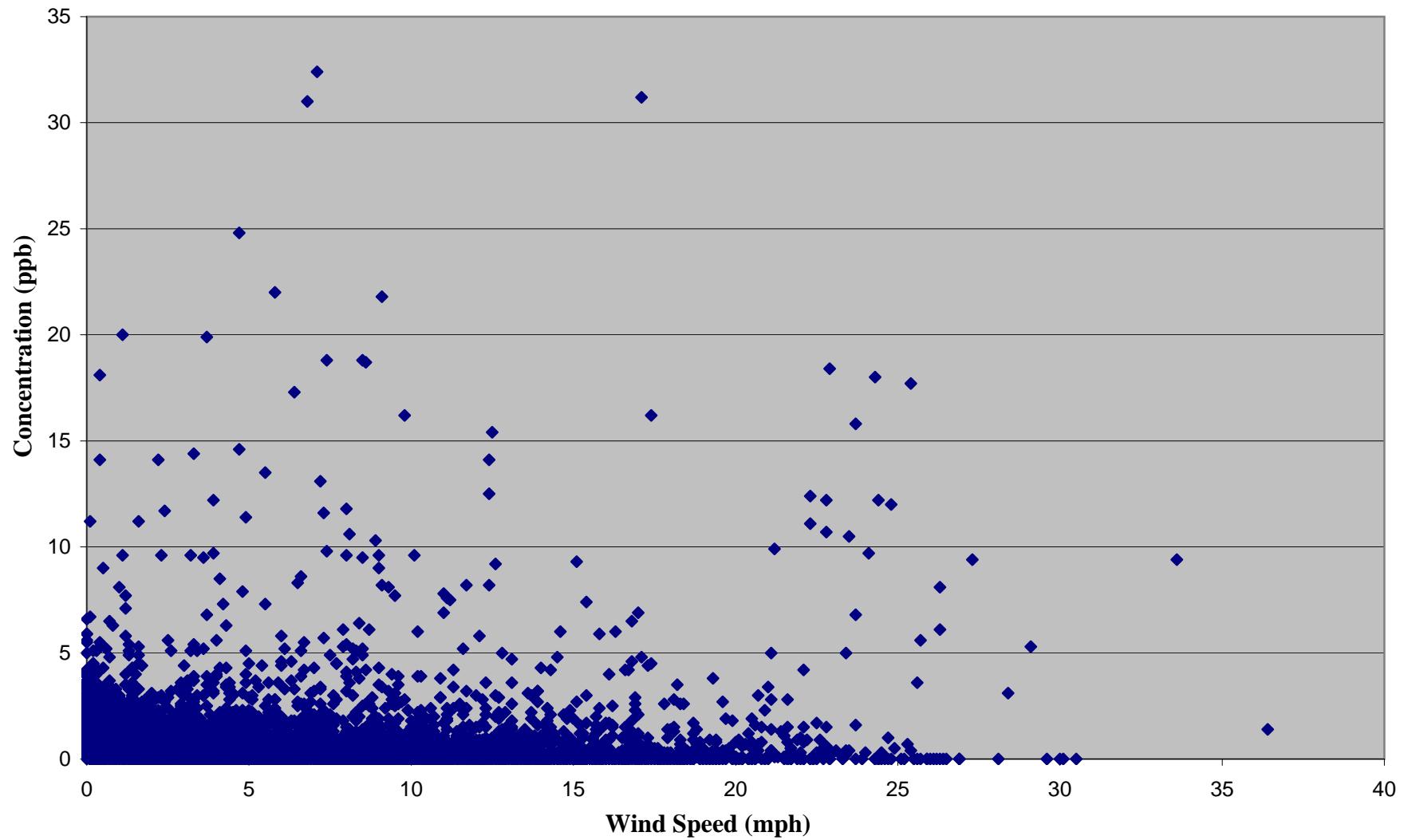
Jewell CAFO: Hydrogen Sulfide vs Time



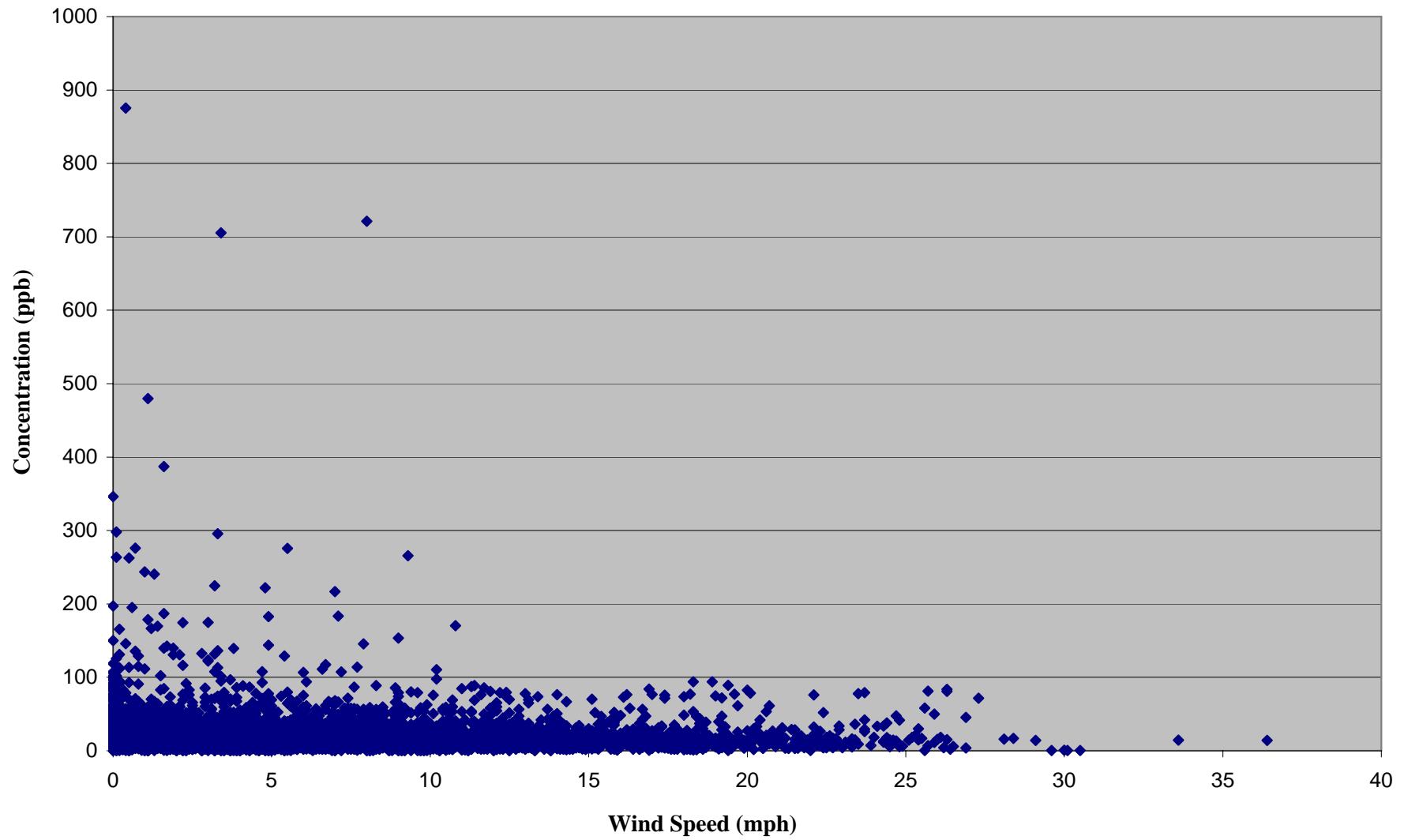
Jewell CAFO: Ammonia vs Time



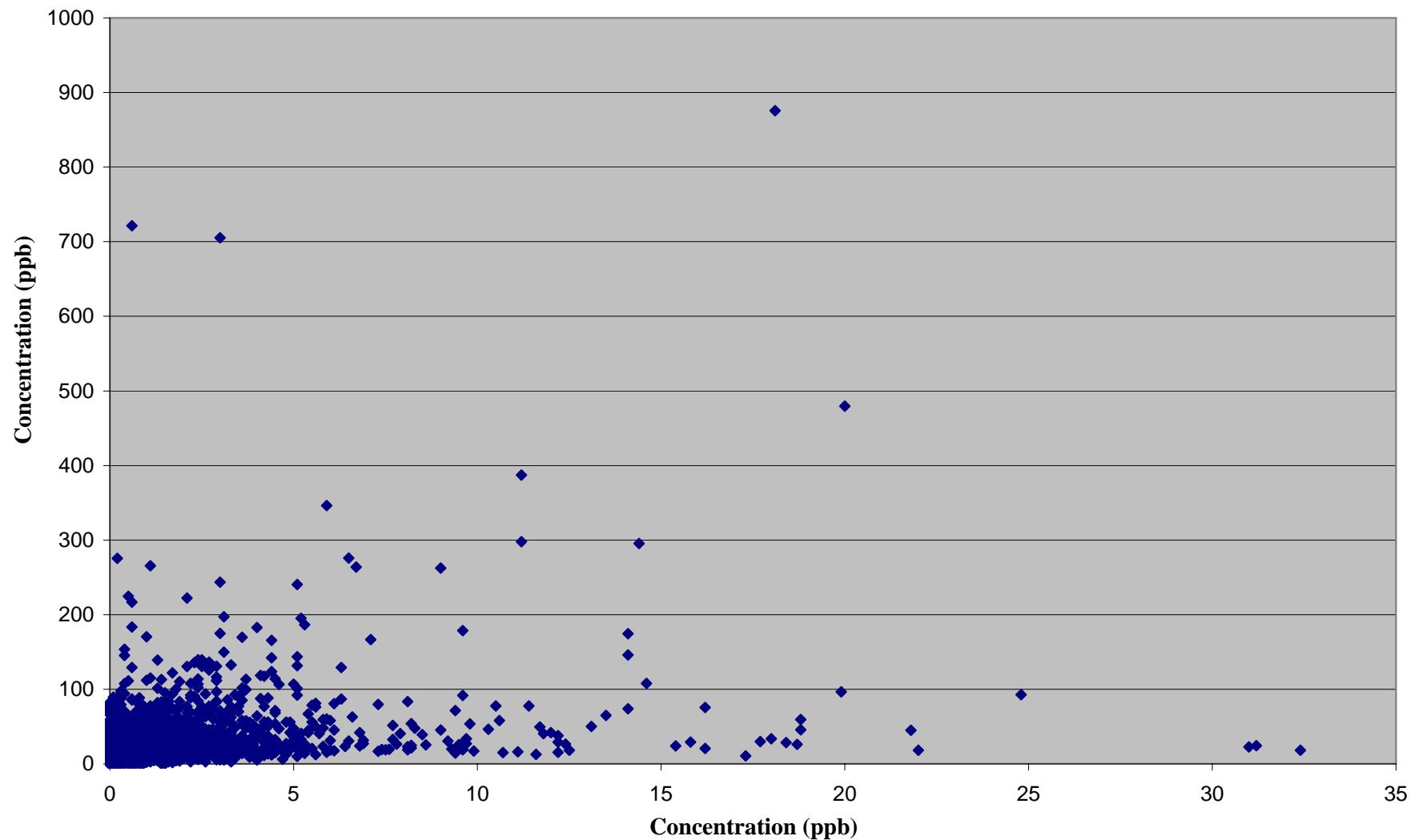
Jewell CAFO: Hydrogen Sulfide vs Wind Speed



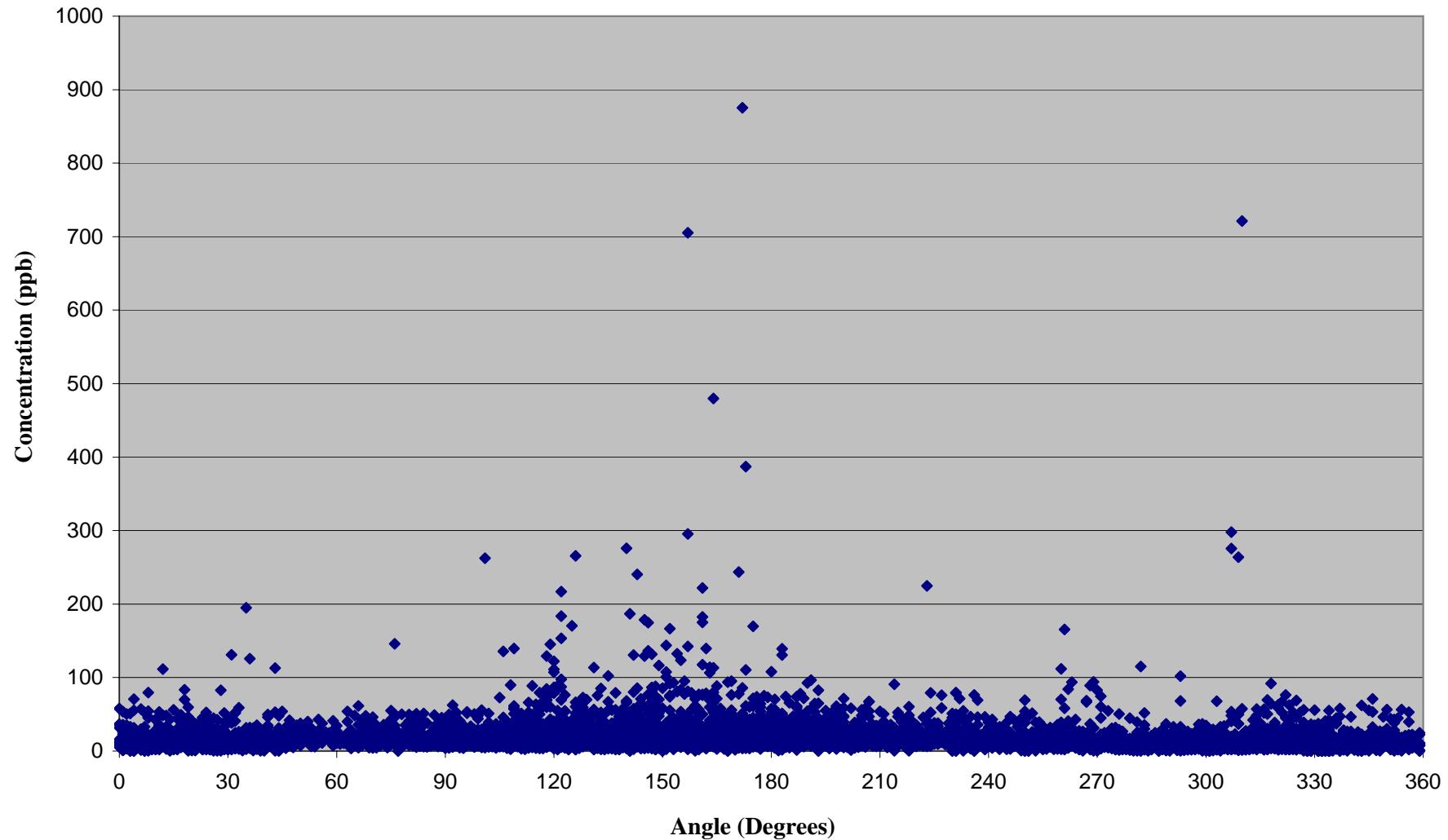
Jewell CAFO: Ammonia vs Wind Speed



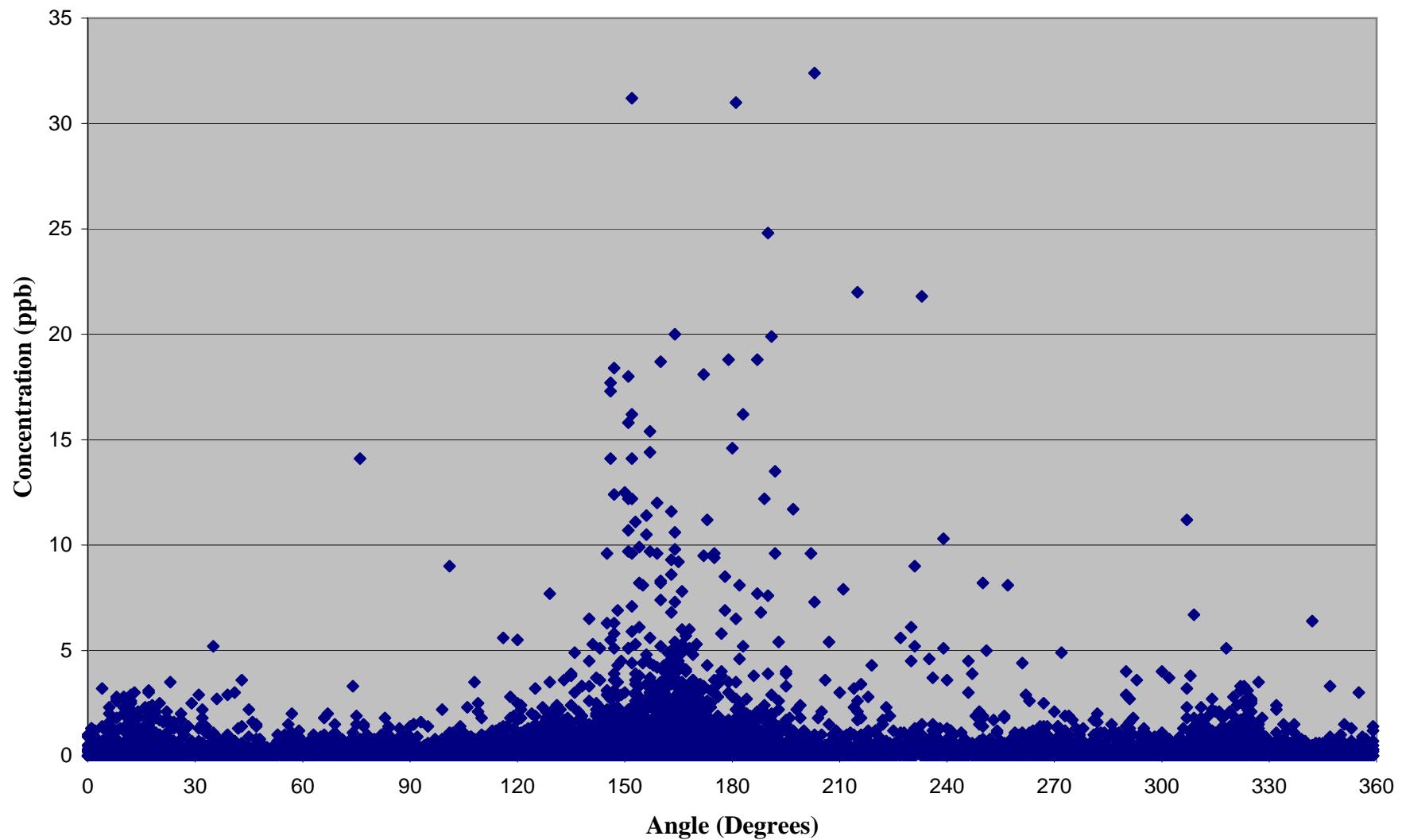
Jewell CAFO: Ammonia vs Hydrogen Sulfide



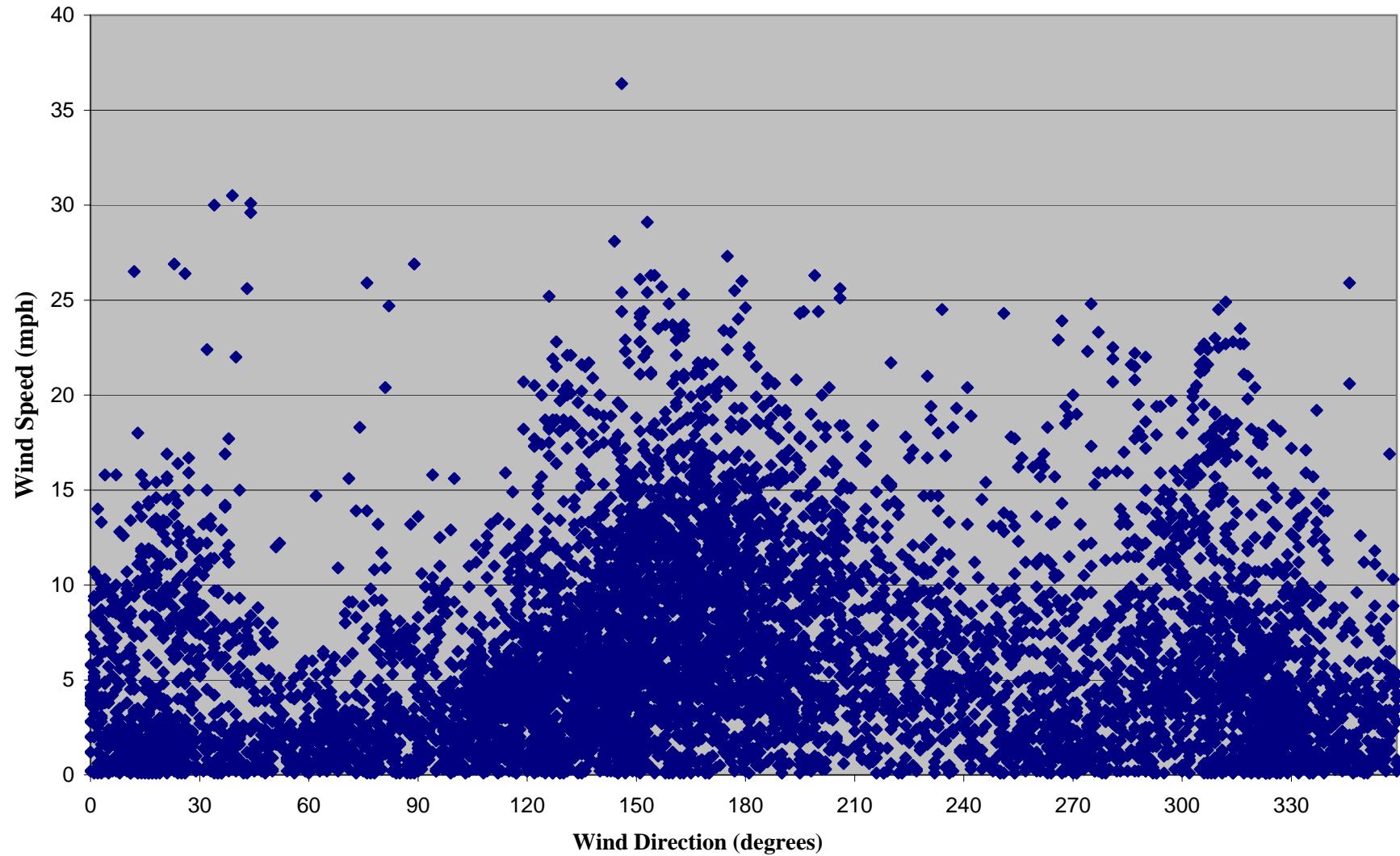
Jewell CAFO: Ammonia vs Wind Direction



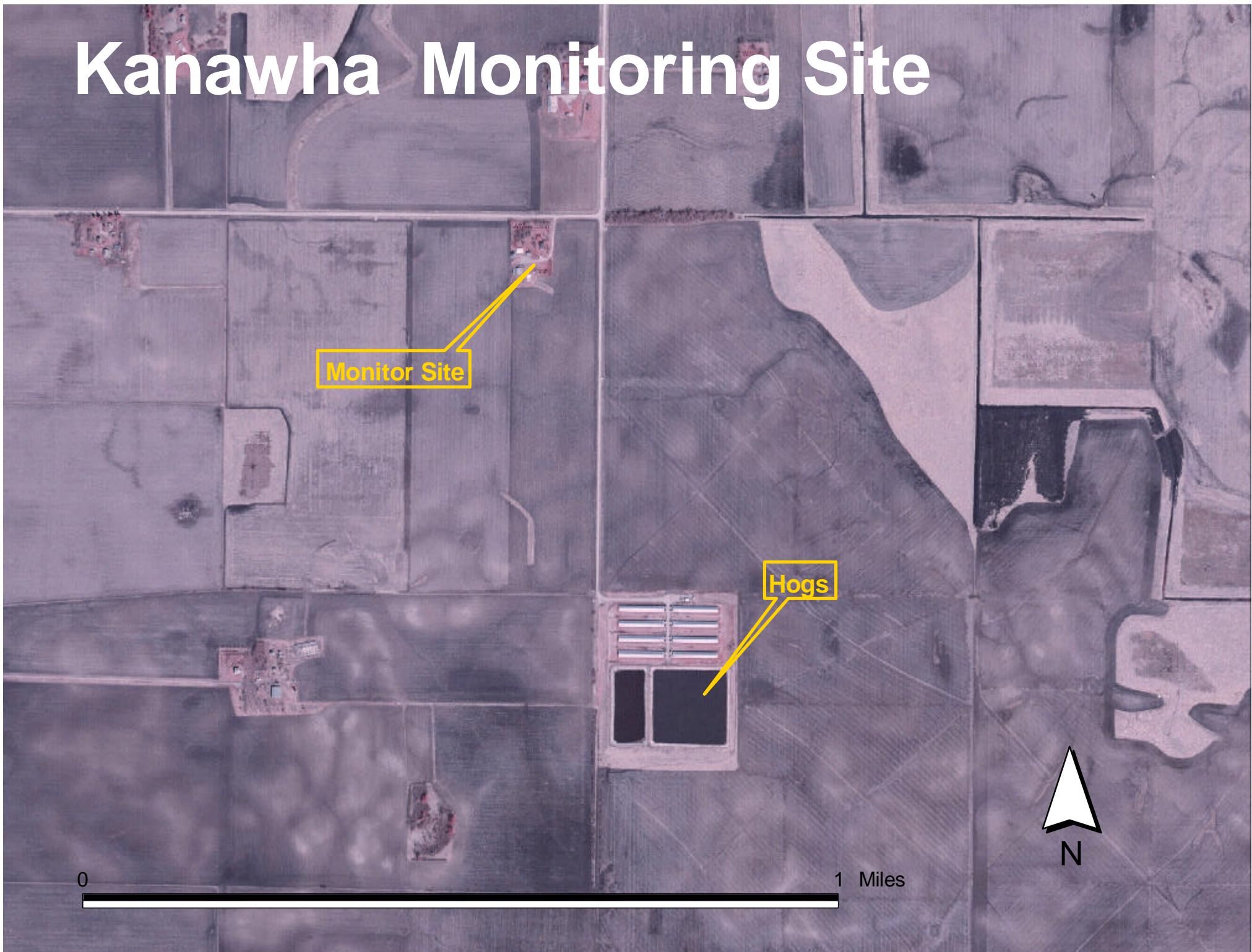
Jewell CAFO-Hydrogen Sulfide vs Wind Direction



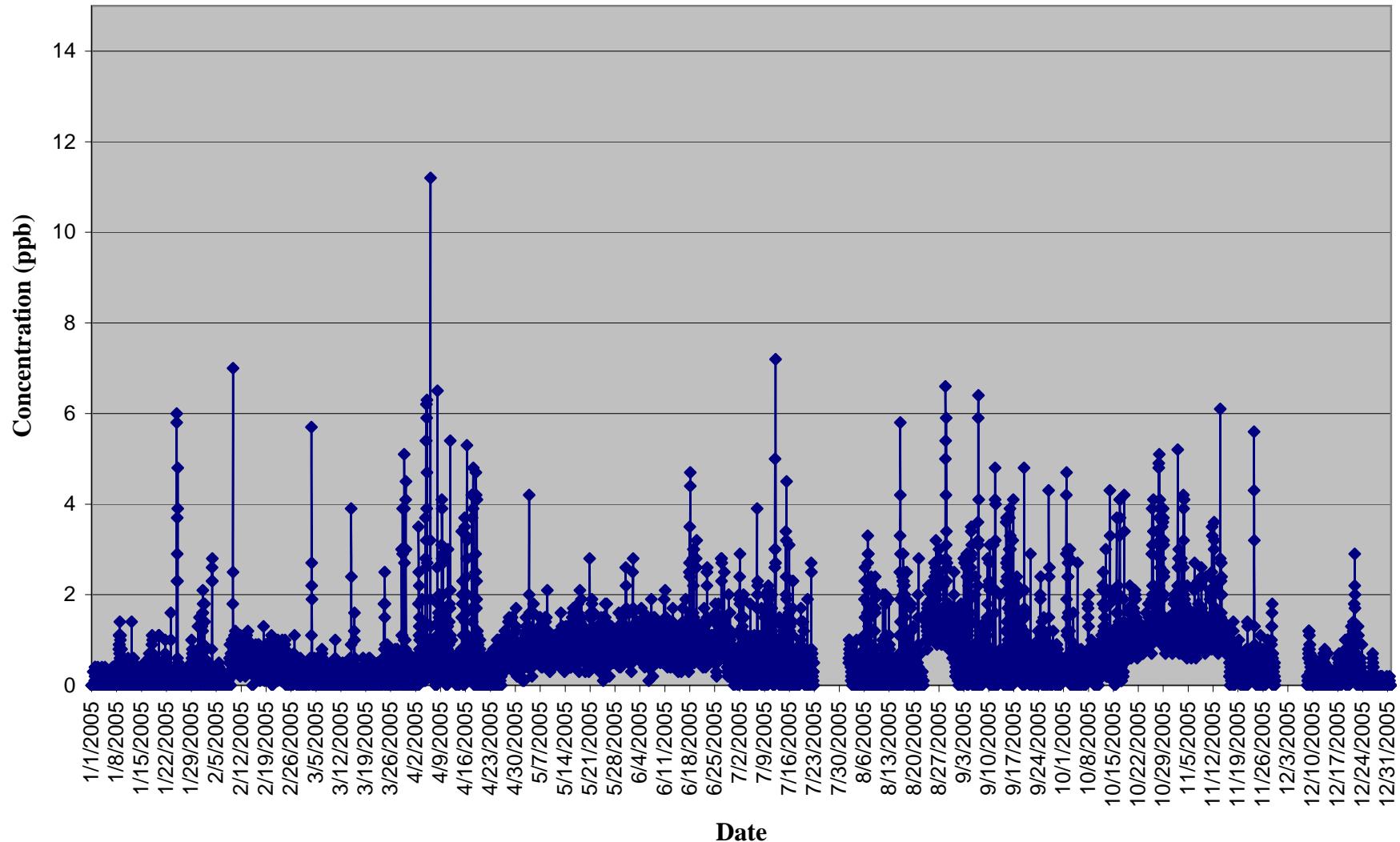
Jewell CAFO: Wind Speed vs Wind Direction



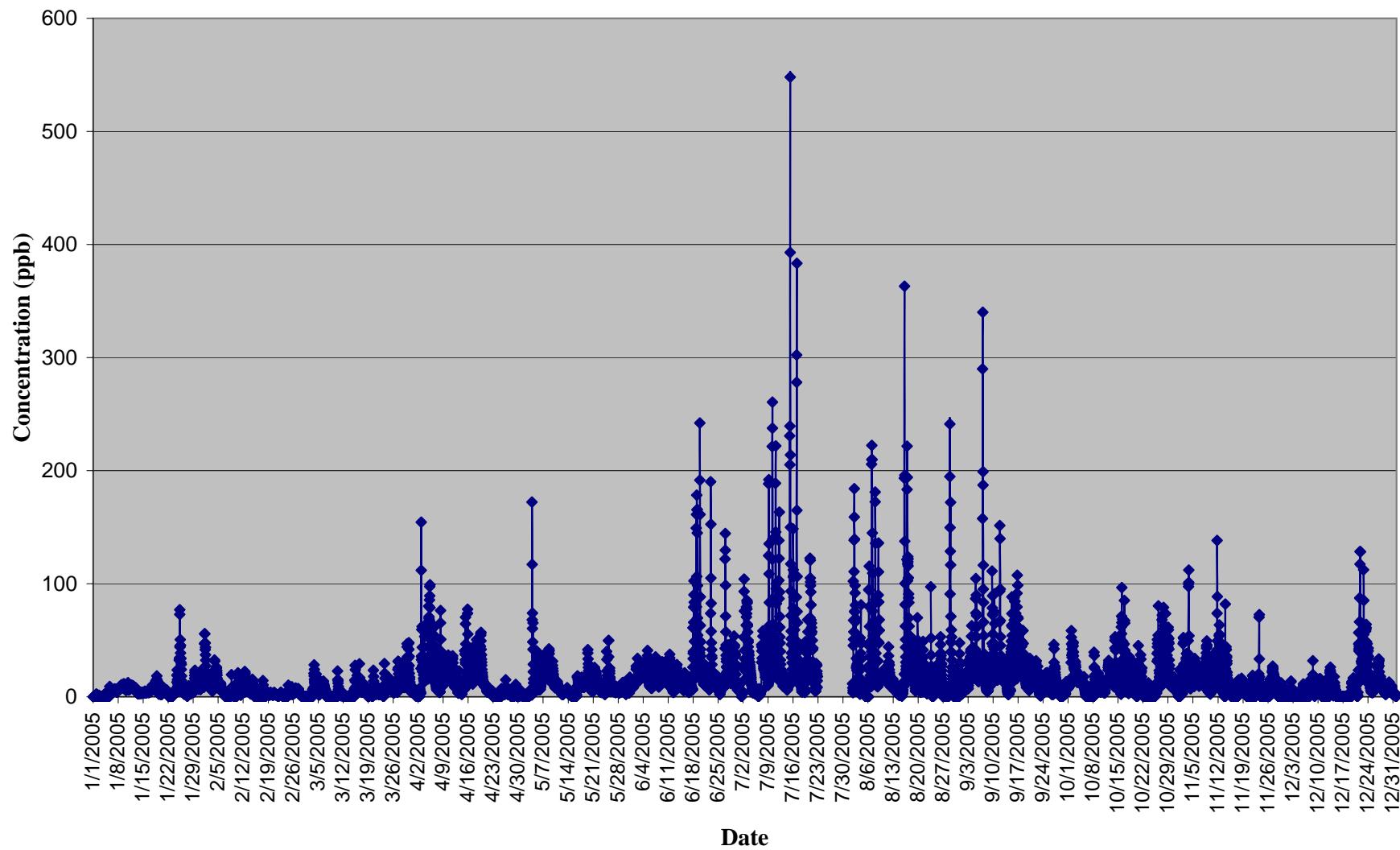
Kanawha Monitoring Site



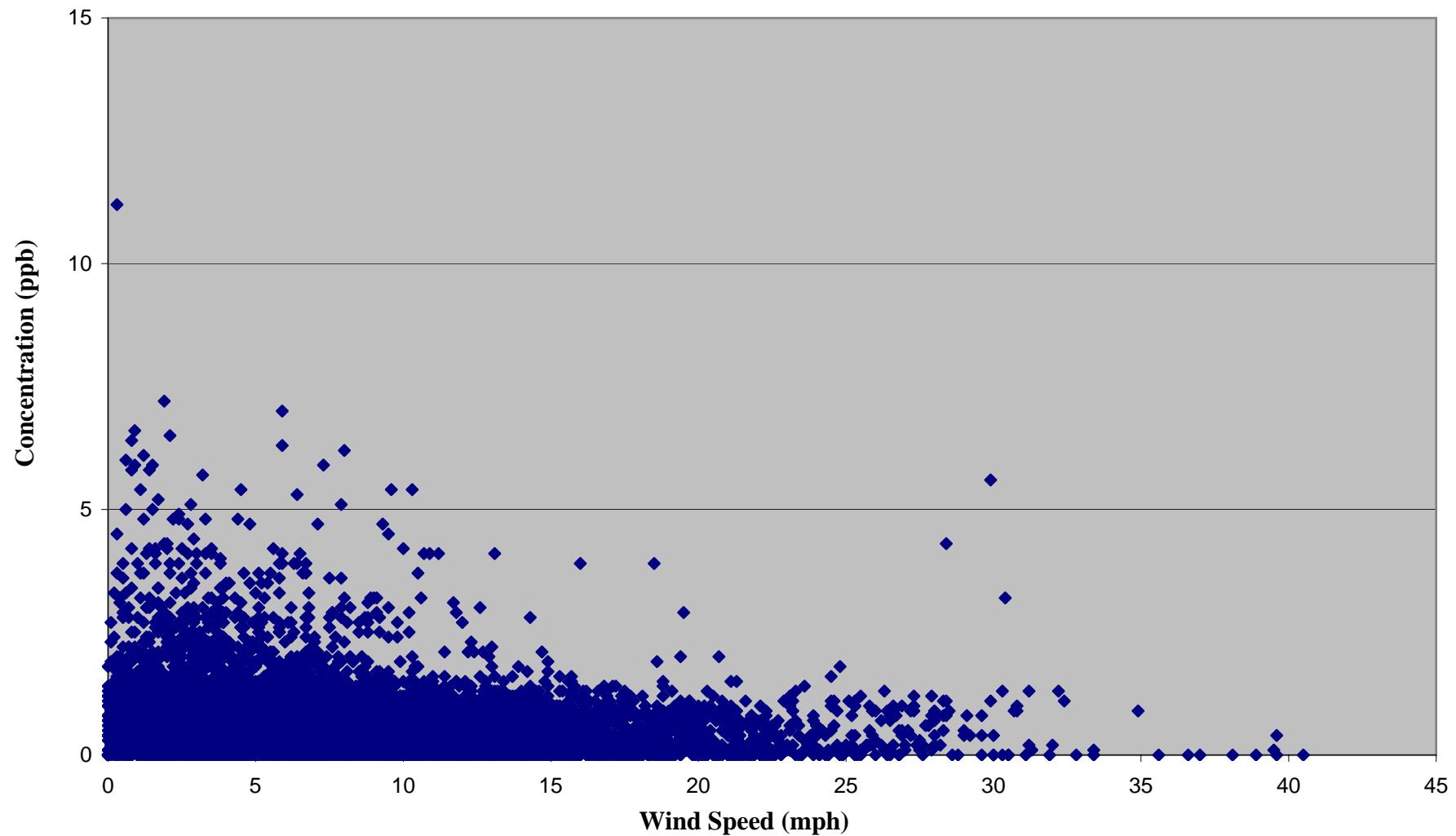
Kanawha CAFO: Hydrogen Sulfide vs Time



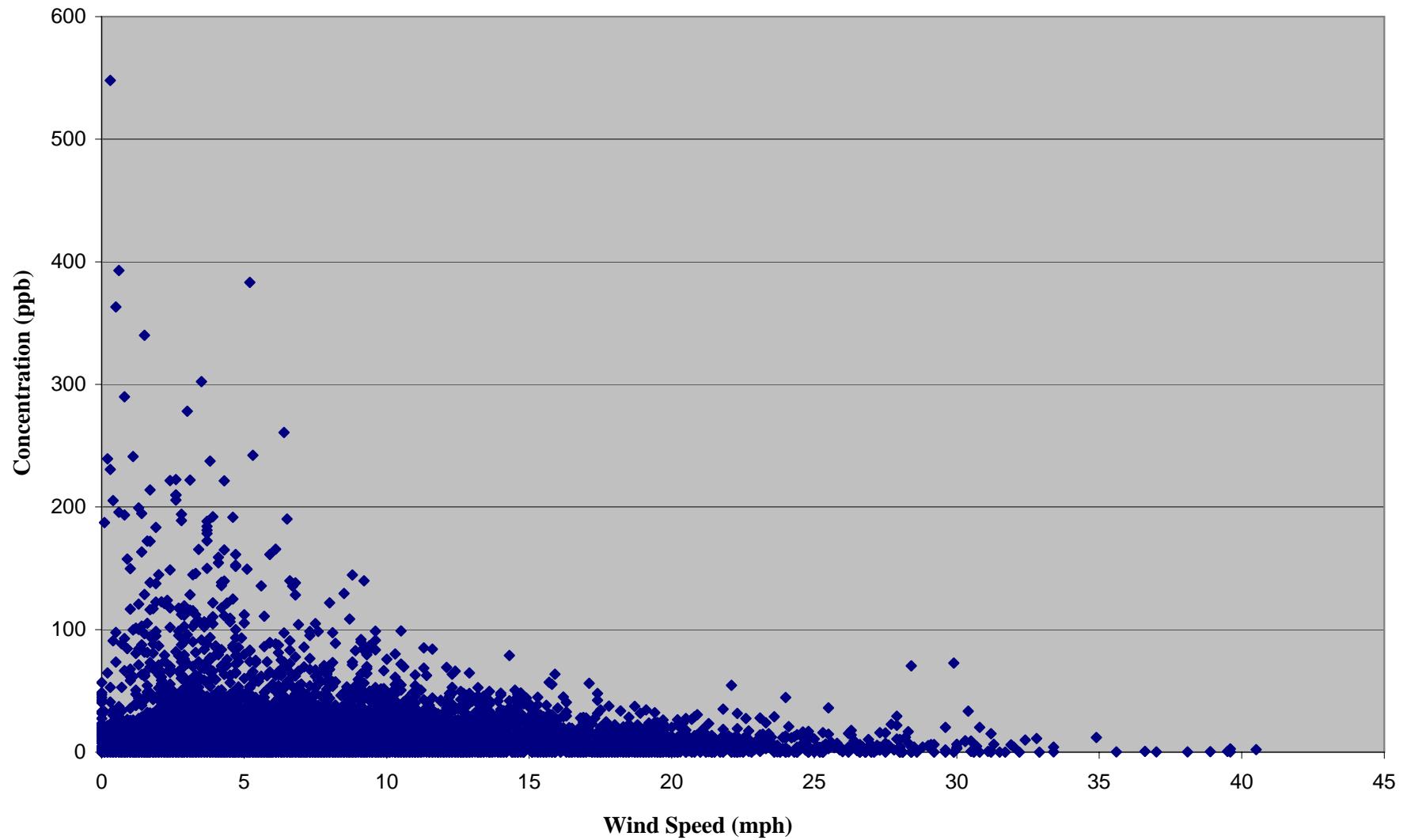
Kanawha CAFO: Ammonia vs Time



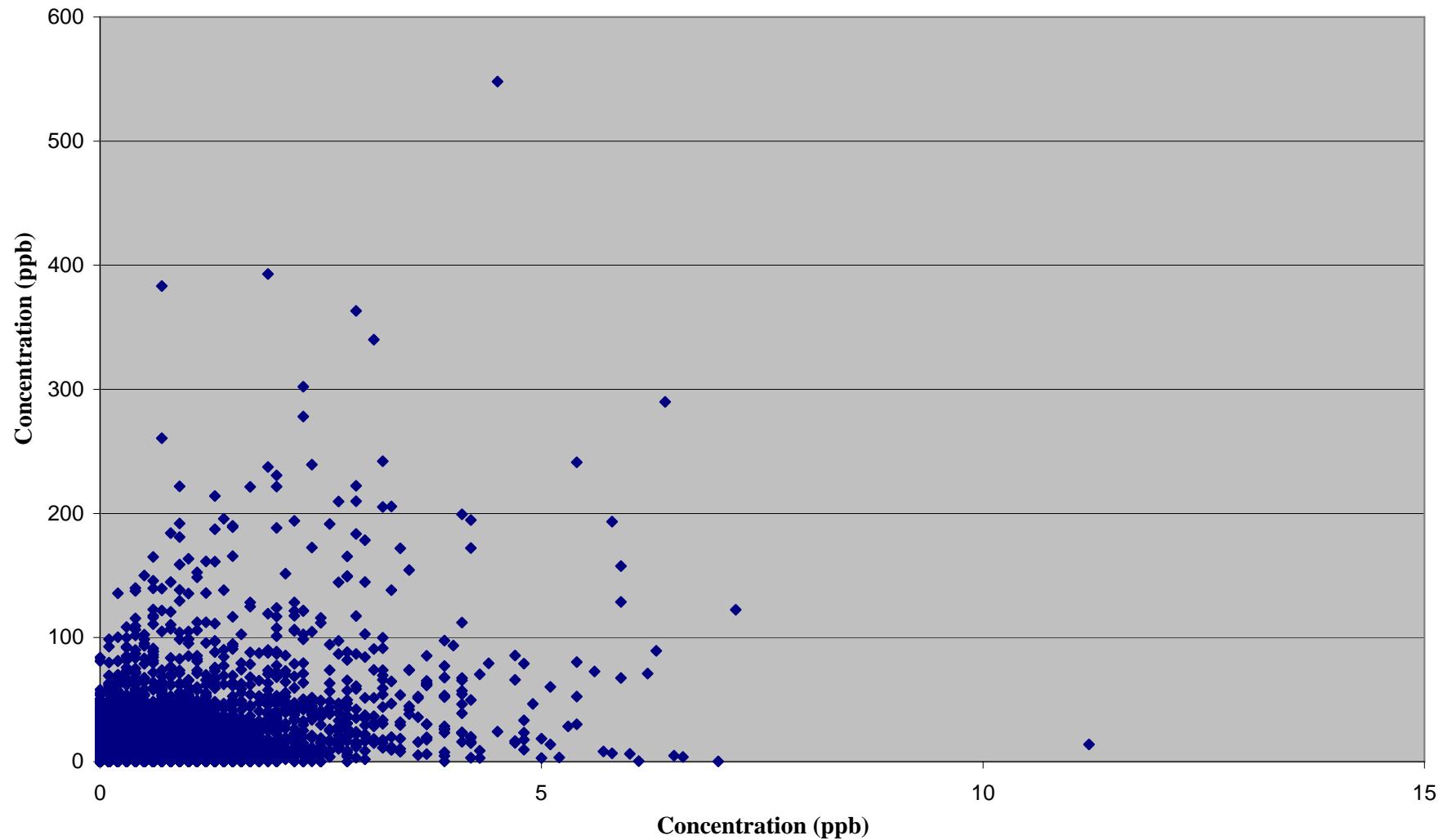
Kanawha CAFO: Hydrogen Sulfide vs Wind Speed



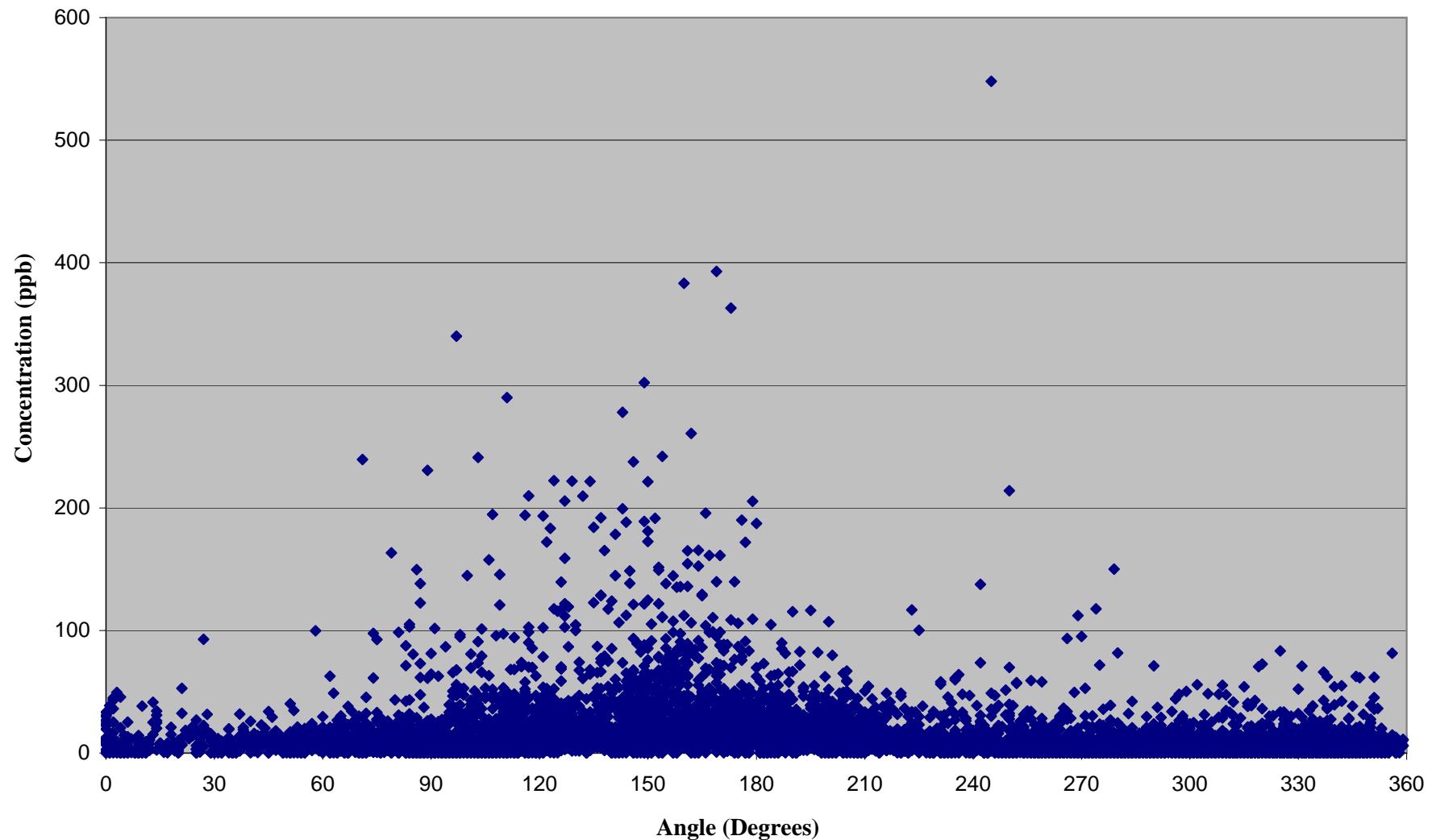
Kanawha CAFO: Ammonia vs Wind Speed



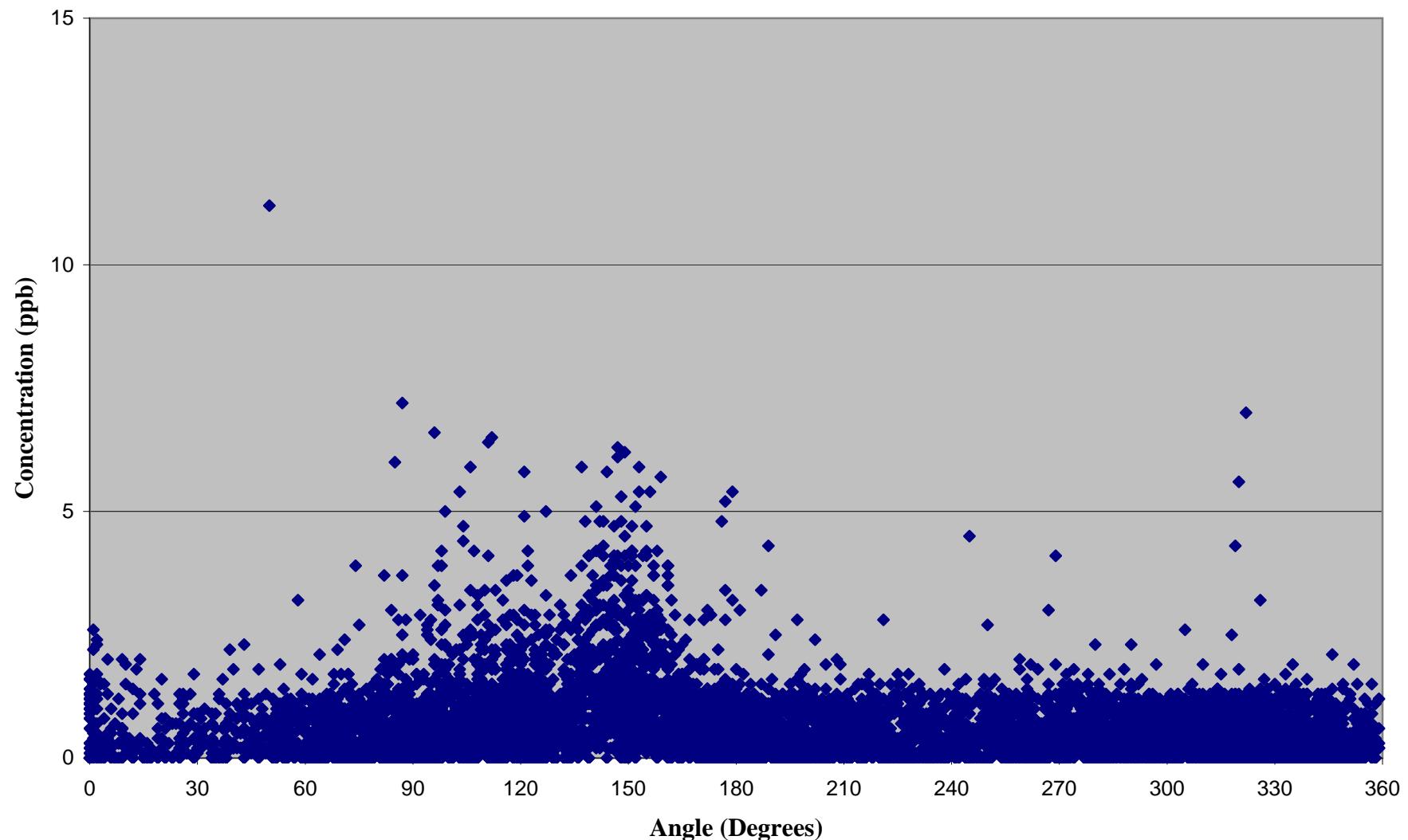
Kanawha CAFO: Ammonia vs Hydrogen Sulfide



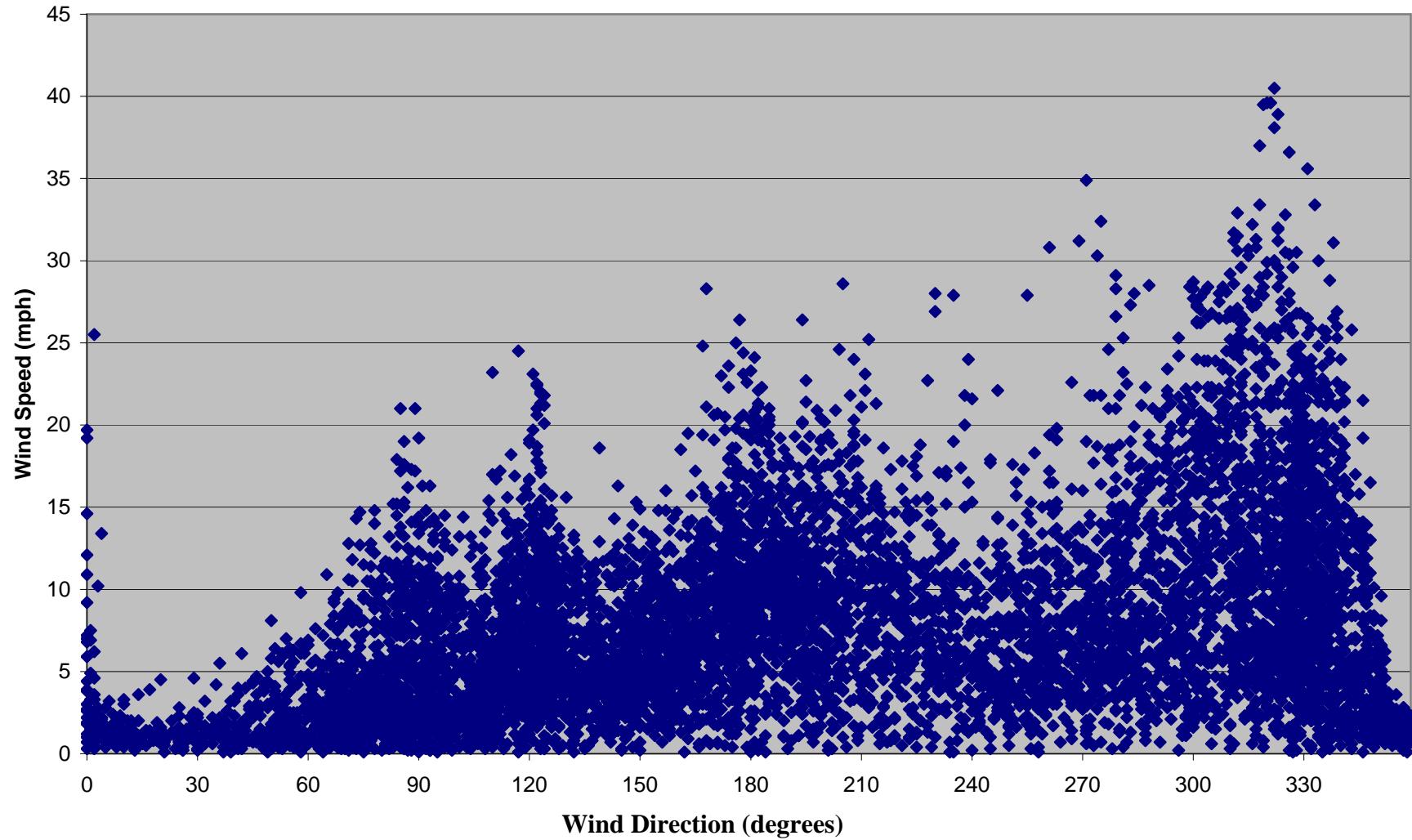
Kanawha CAFO: Ammonia vs Wind Direction



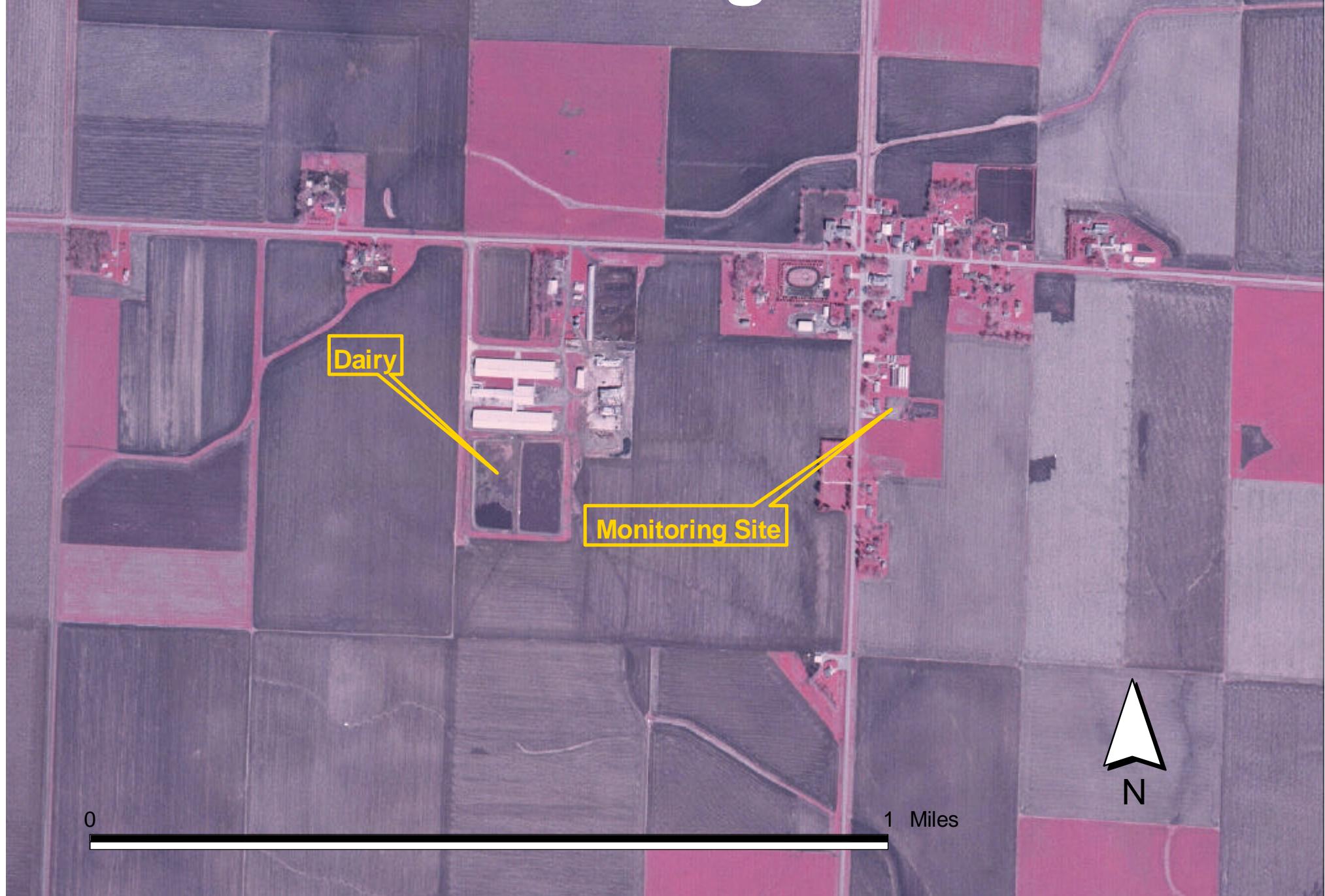
Kanawha CAFO-Hydrogen Sulfide vs Wind Direction



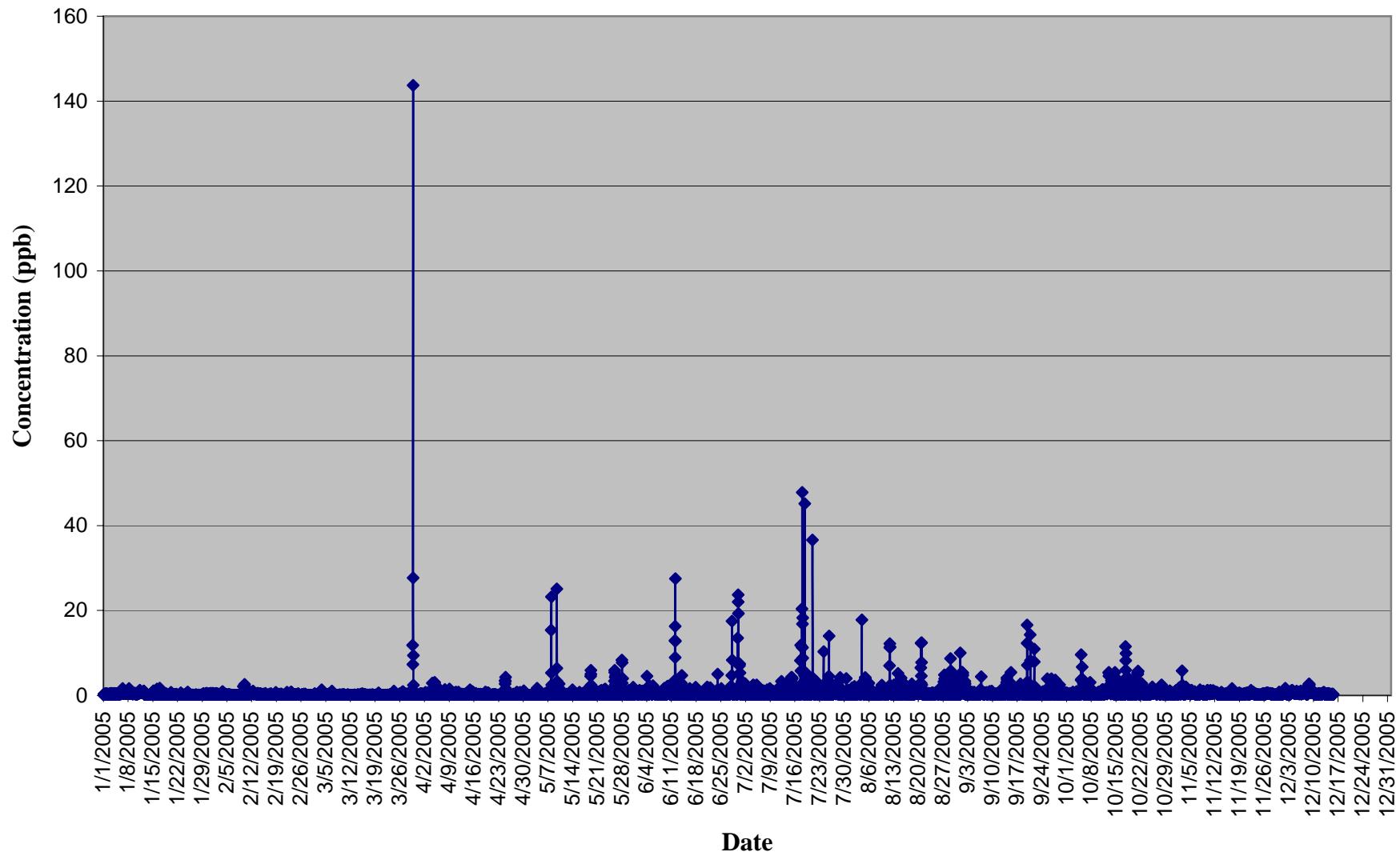
Kanawha CAFO: Wind Speed vs Wind Direction



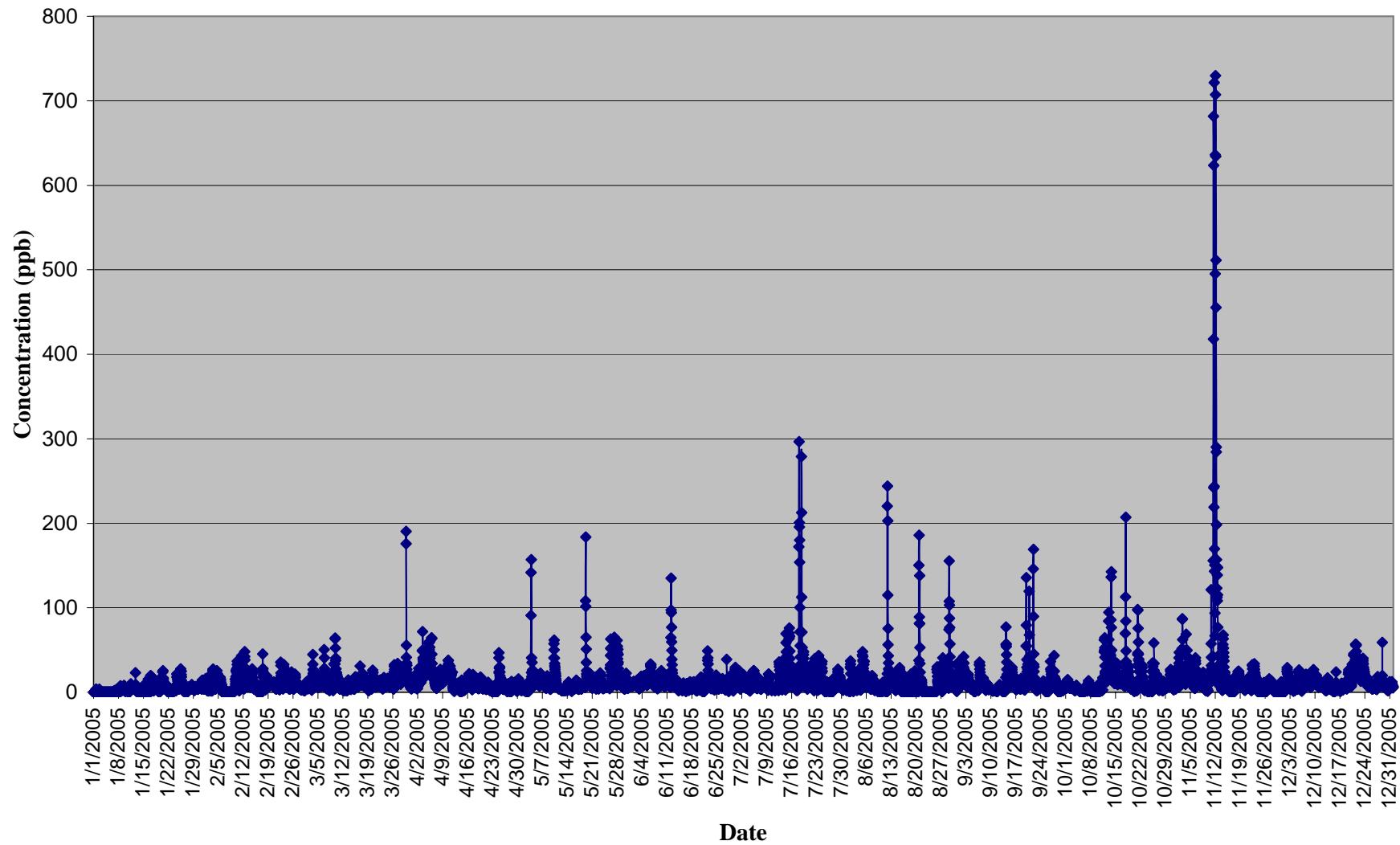
Newkirk Monitoring Site



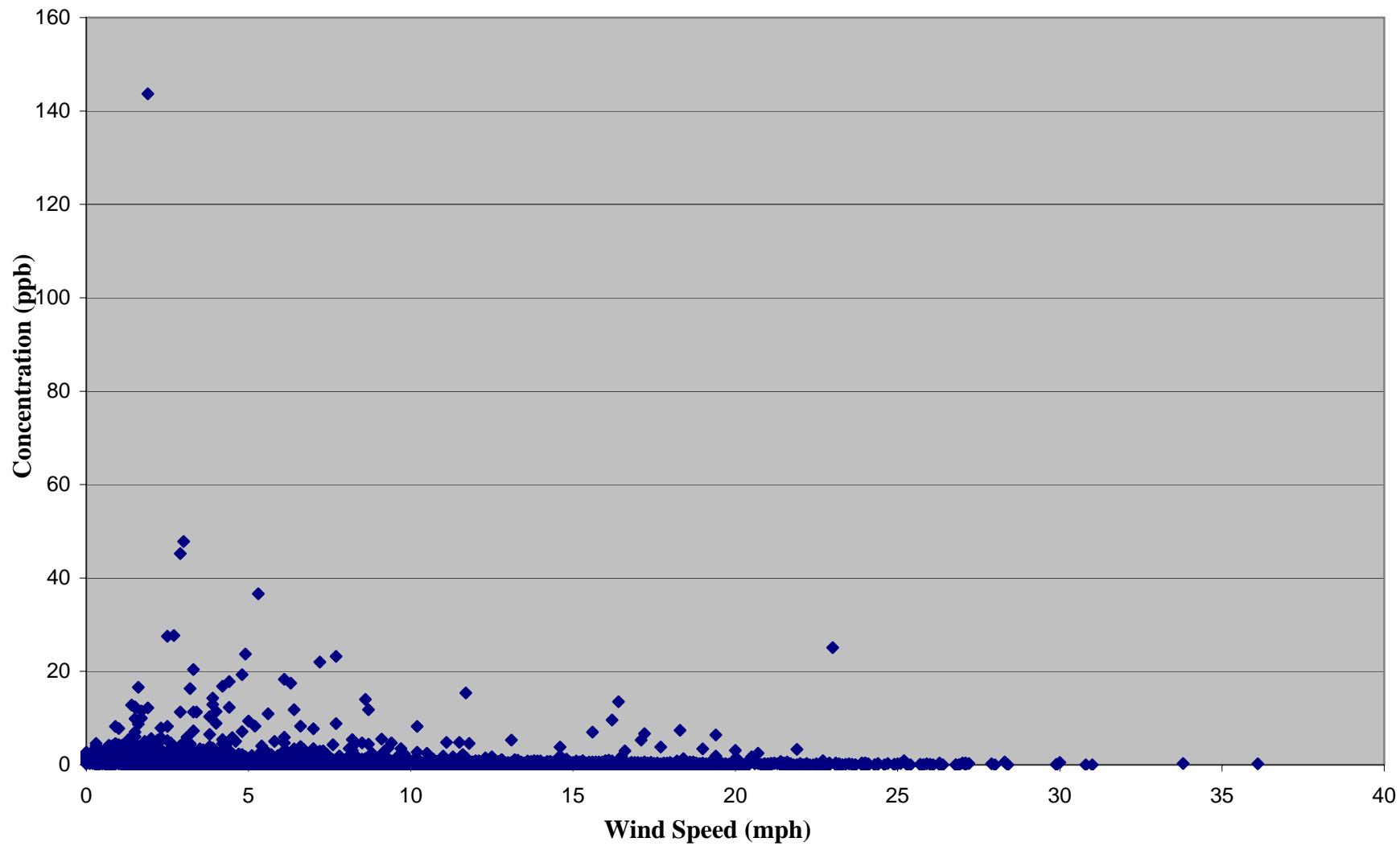
Newkirk CAFO: Hydrogen Sulfide vs Time



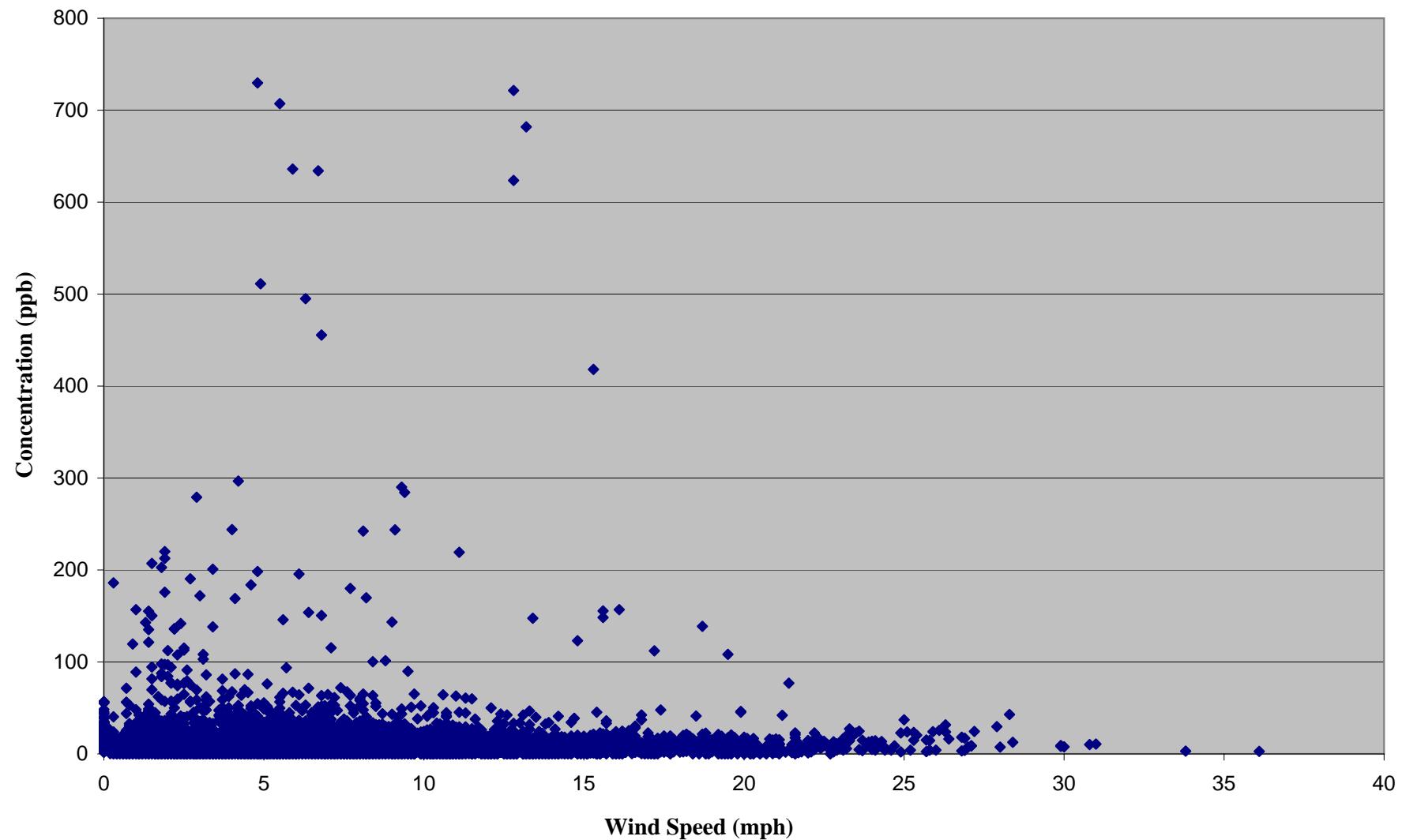
Newkirk CAFO: Ammonia vs Time



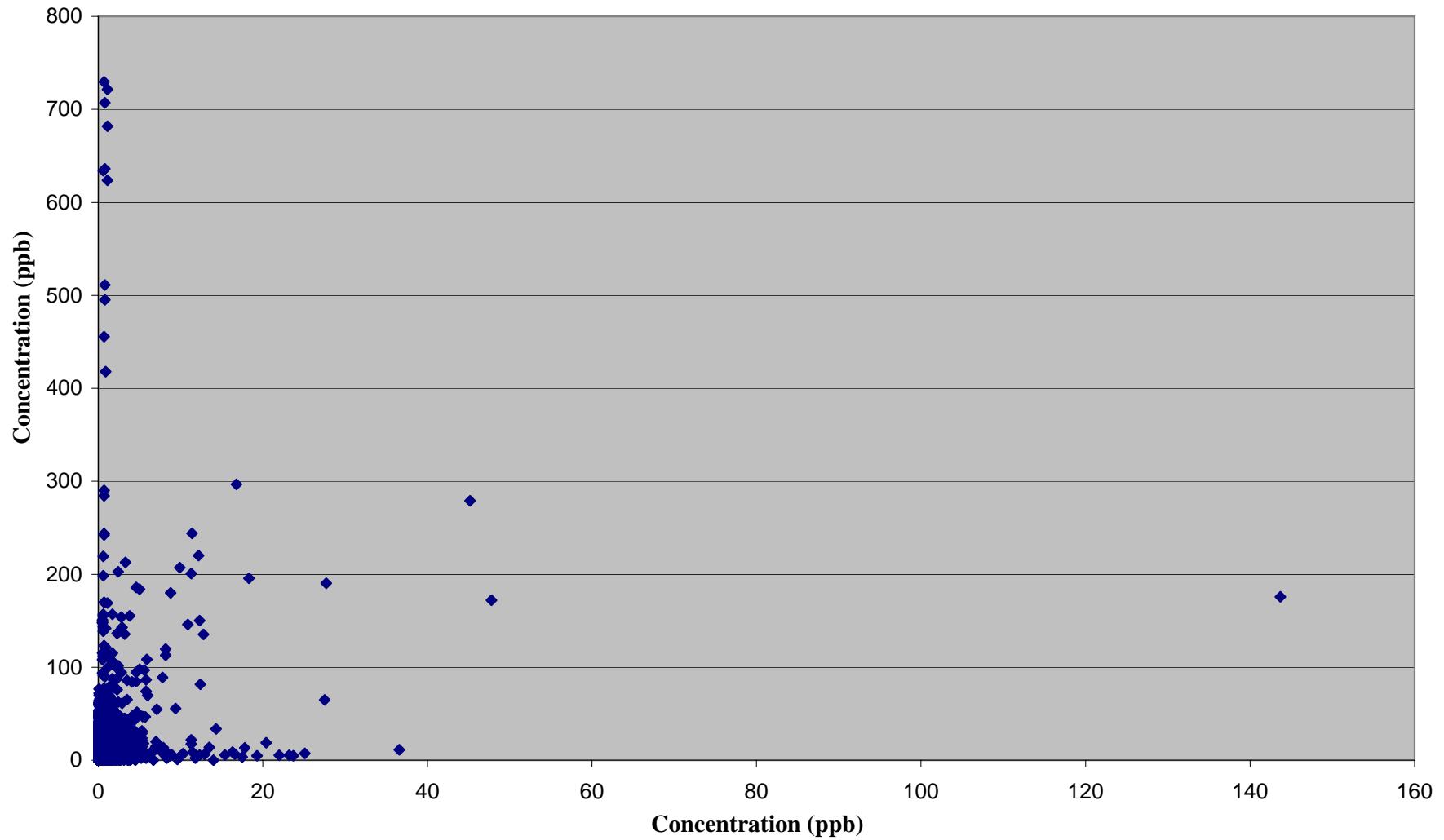
Newkirk CAFO: Hydrogen Sulfide vs Wind Speed



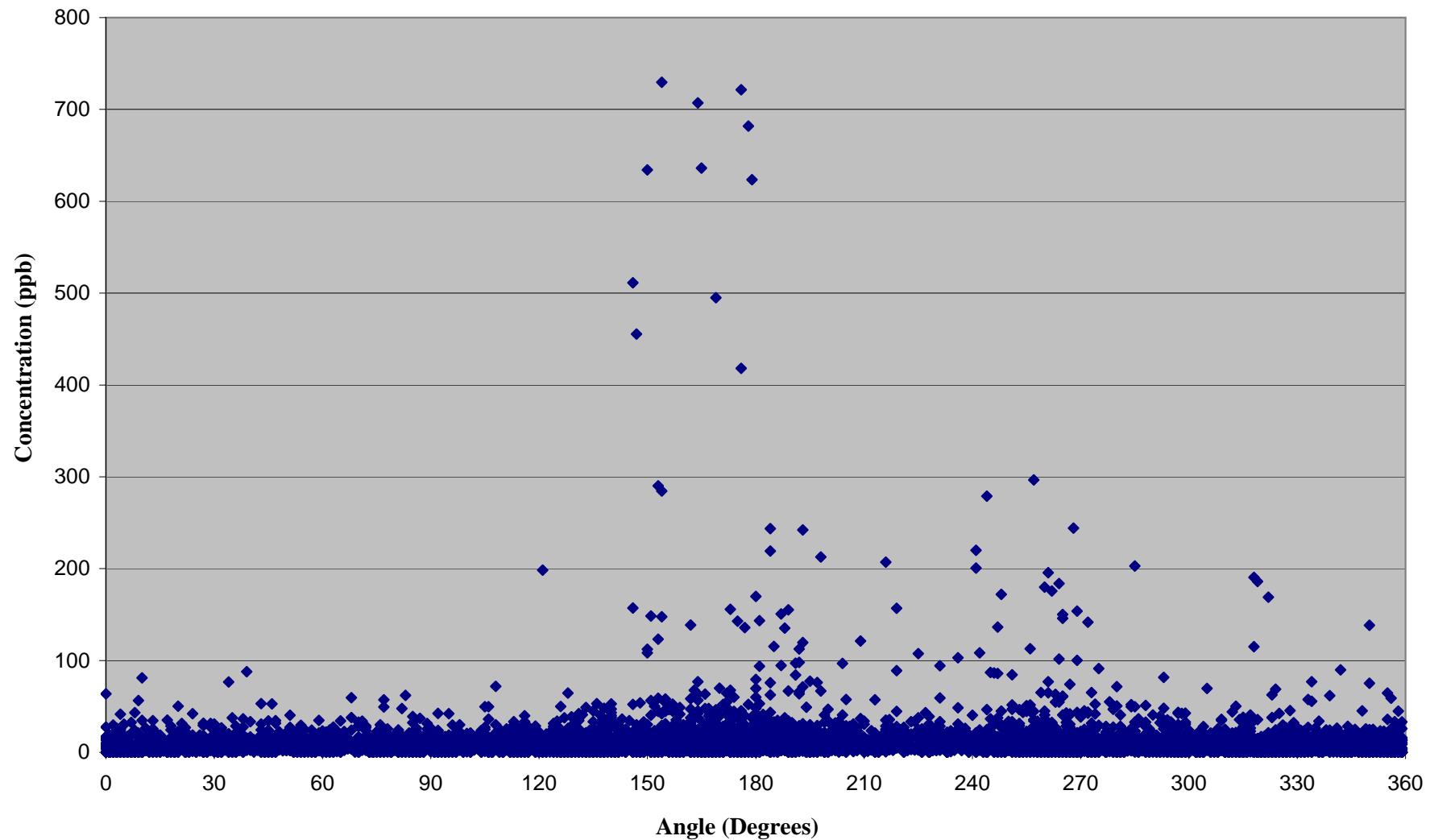
Newkirk CAFO: Ammonia vs Wind Speed



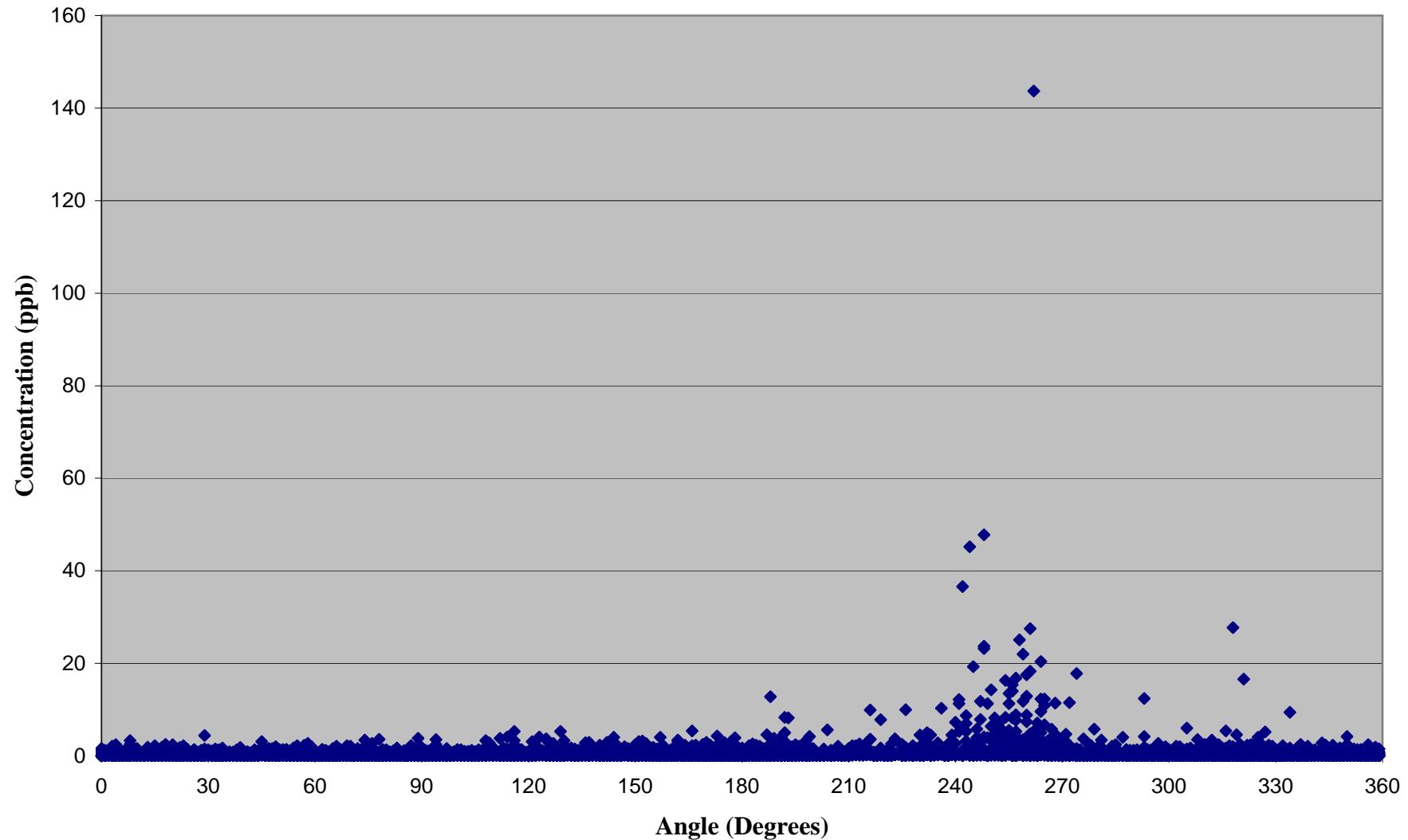
Newkirk CAFO: Ammonia vs Hydrogen Sulfide



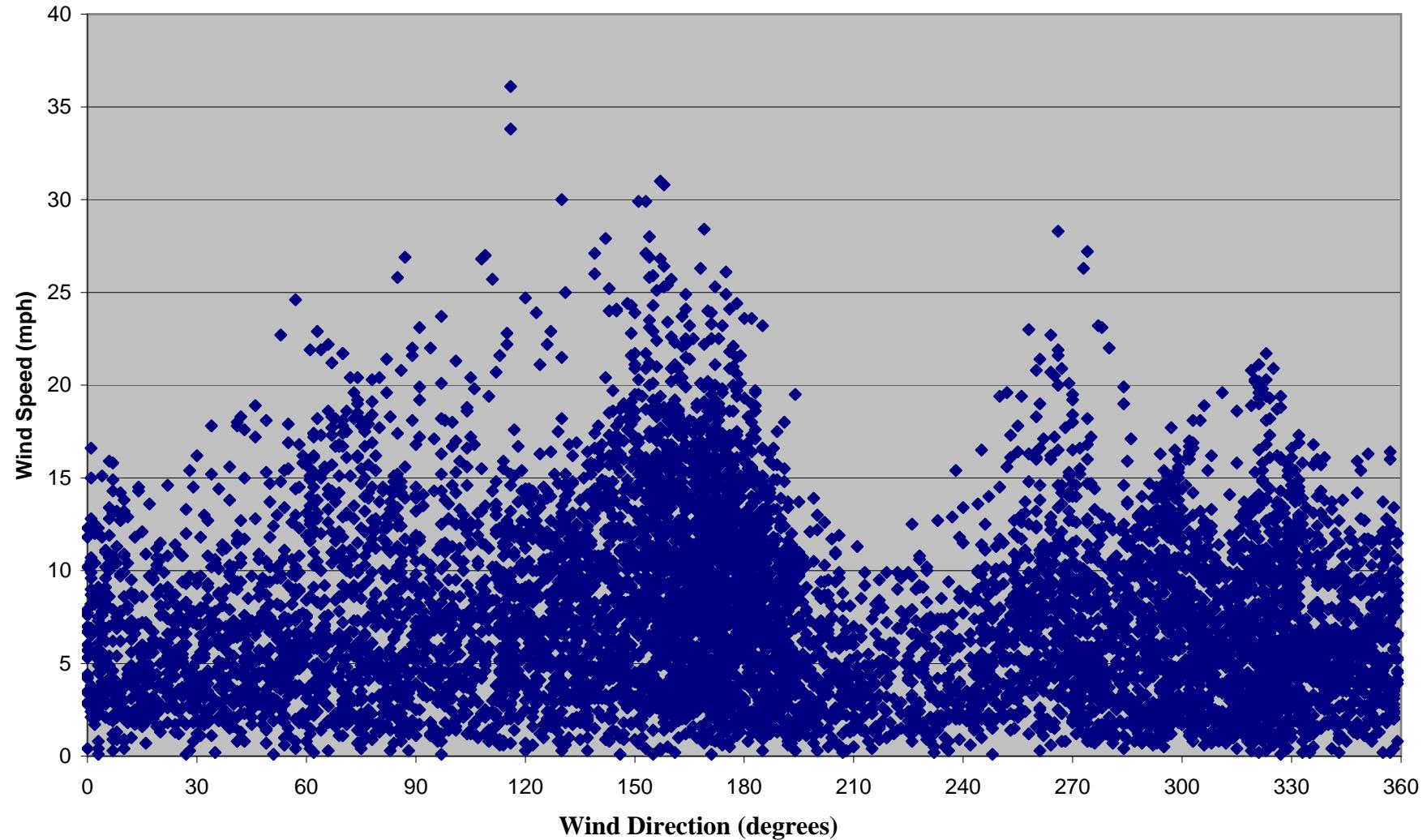
Newkirk CAFO: Ammonia vs Wind Direction



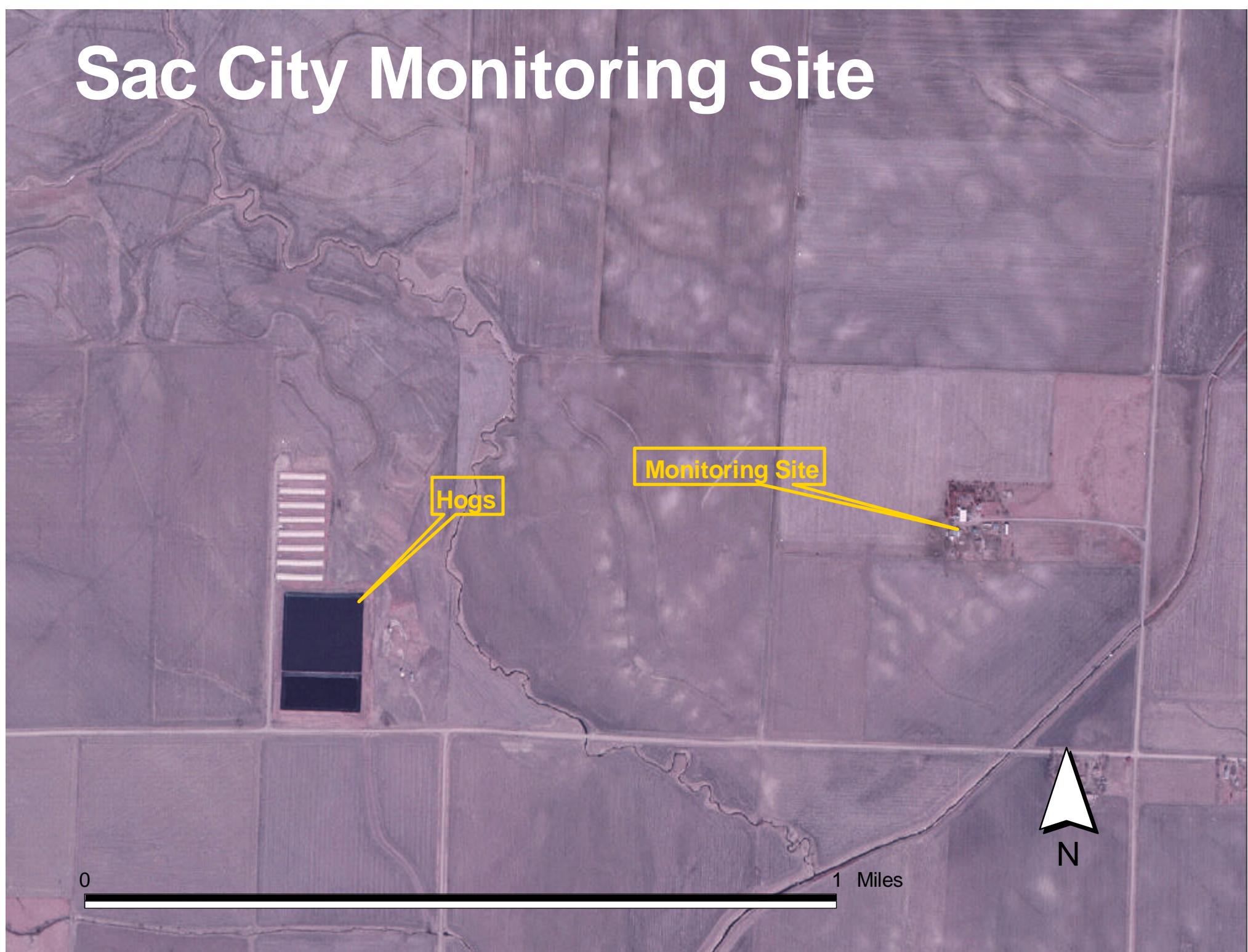
Newkirk CAFO-Hydrogen Sulfide vs Wind Direction



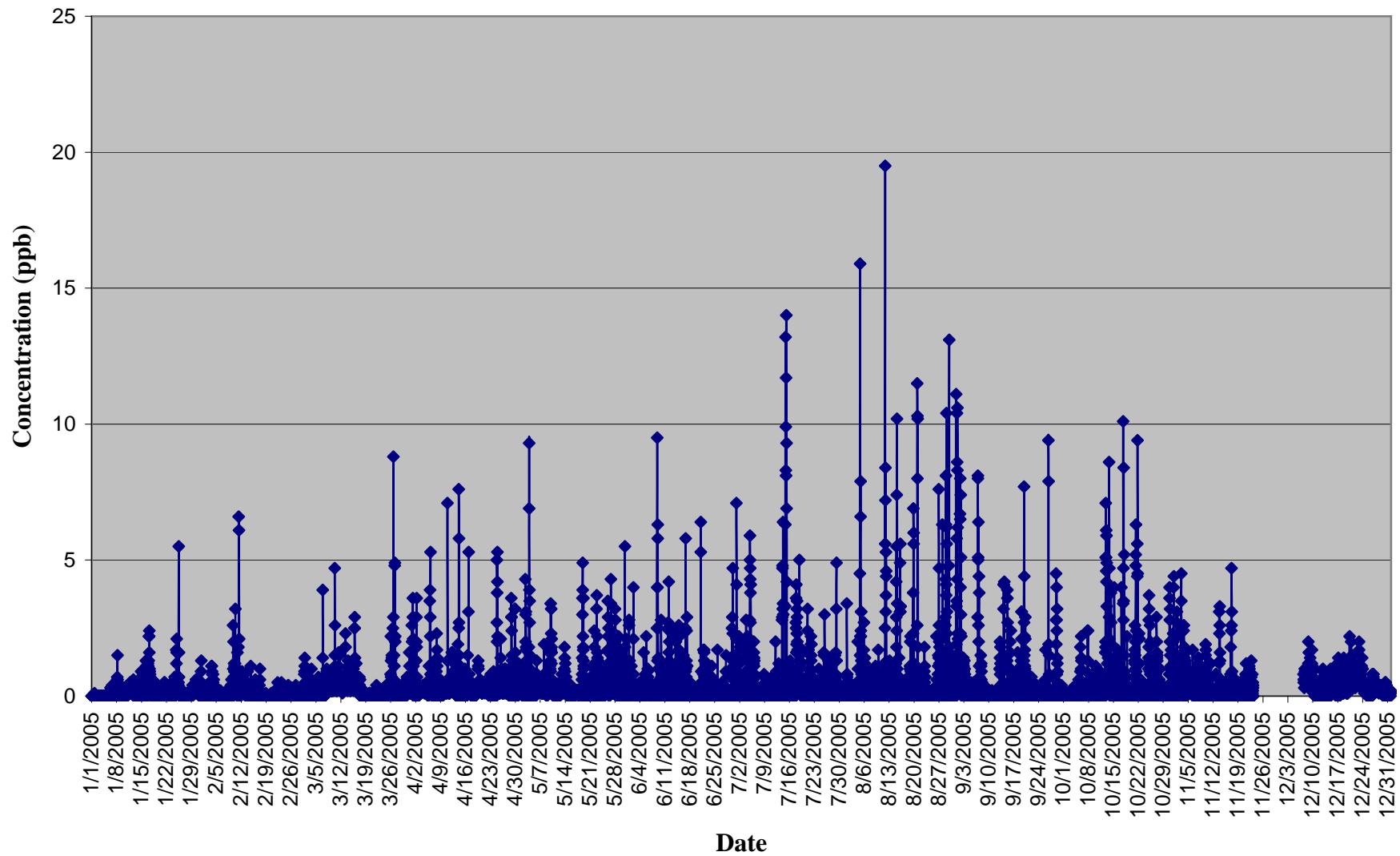
Newkirk CAFO: Wind Speed vs Wind Direction



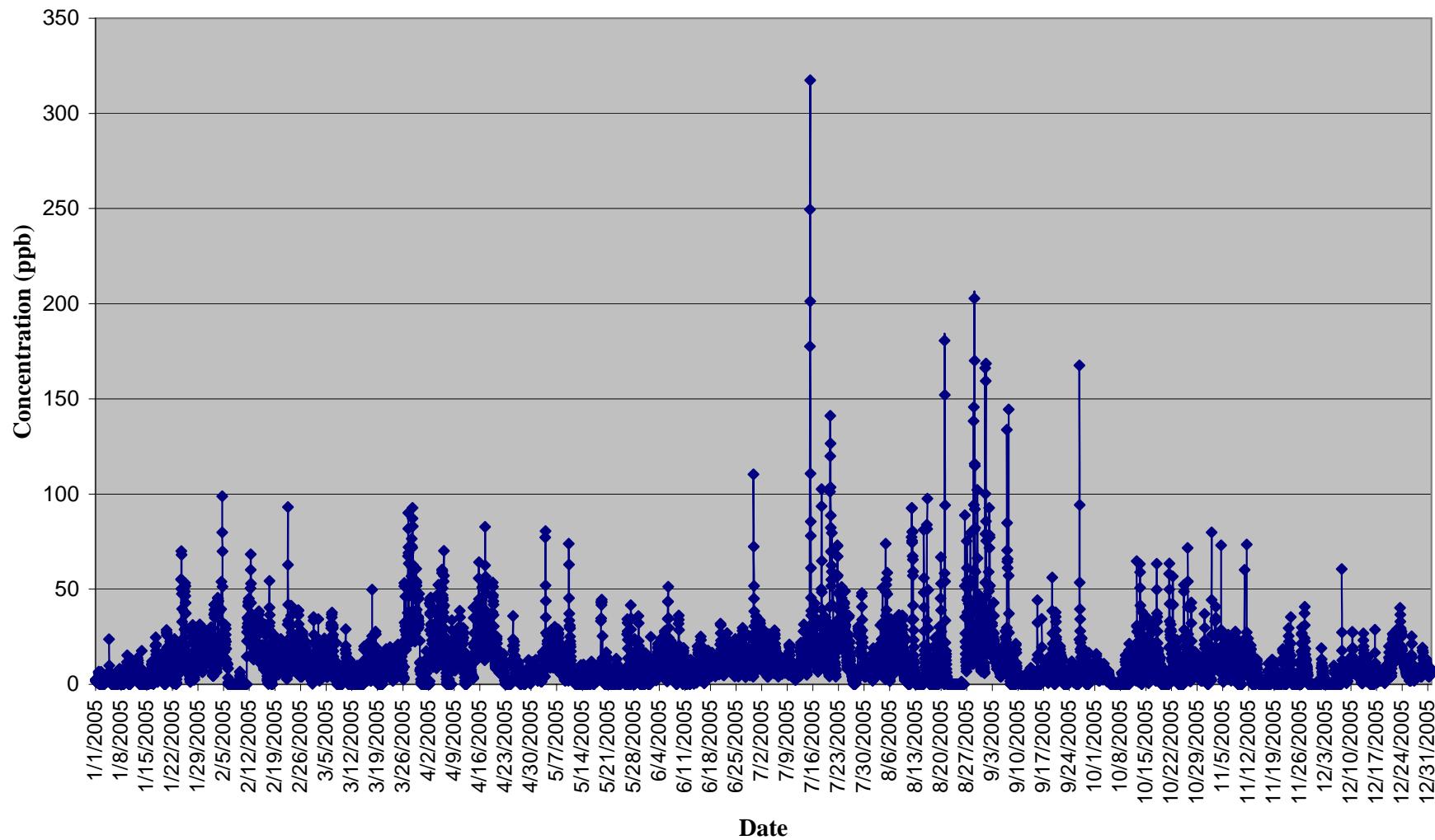
Sac City Monitoring Site



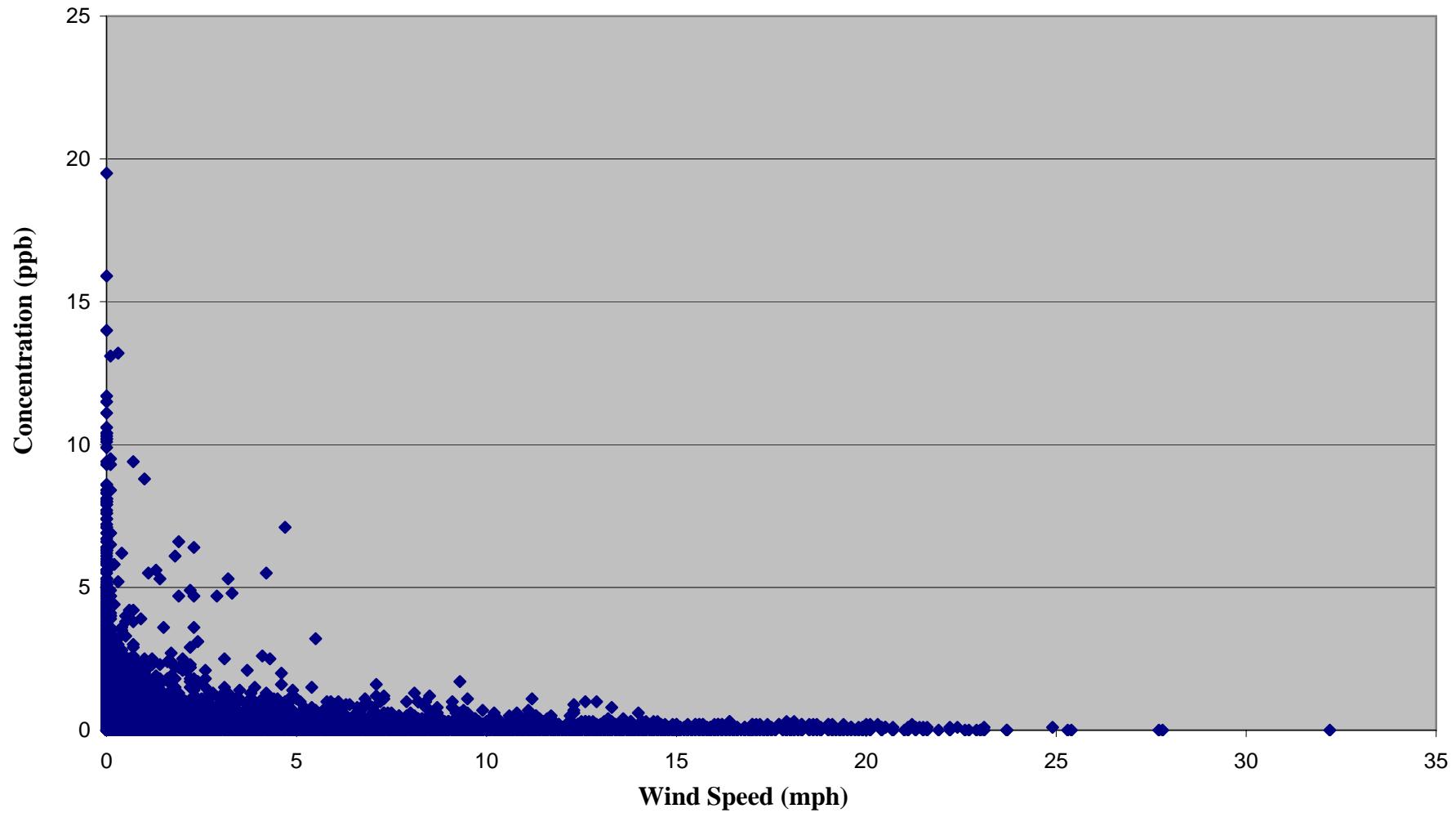
Sac City CAFO: Hydrogen Sulfide vs Time



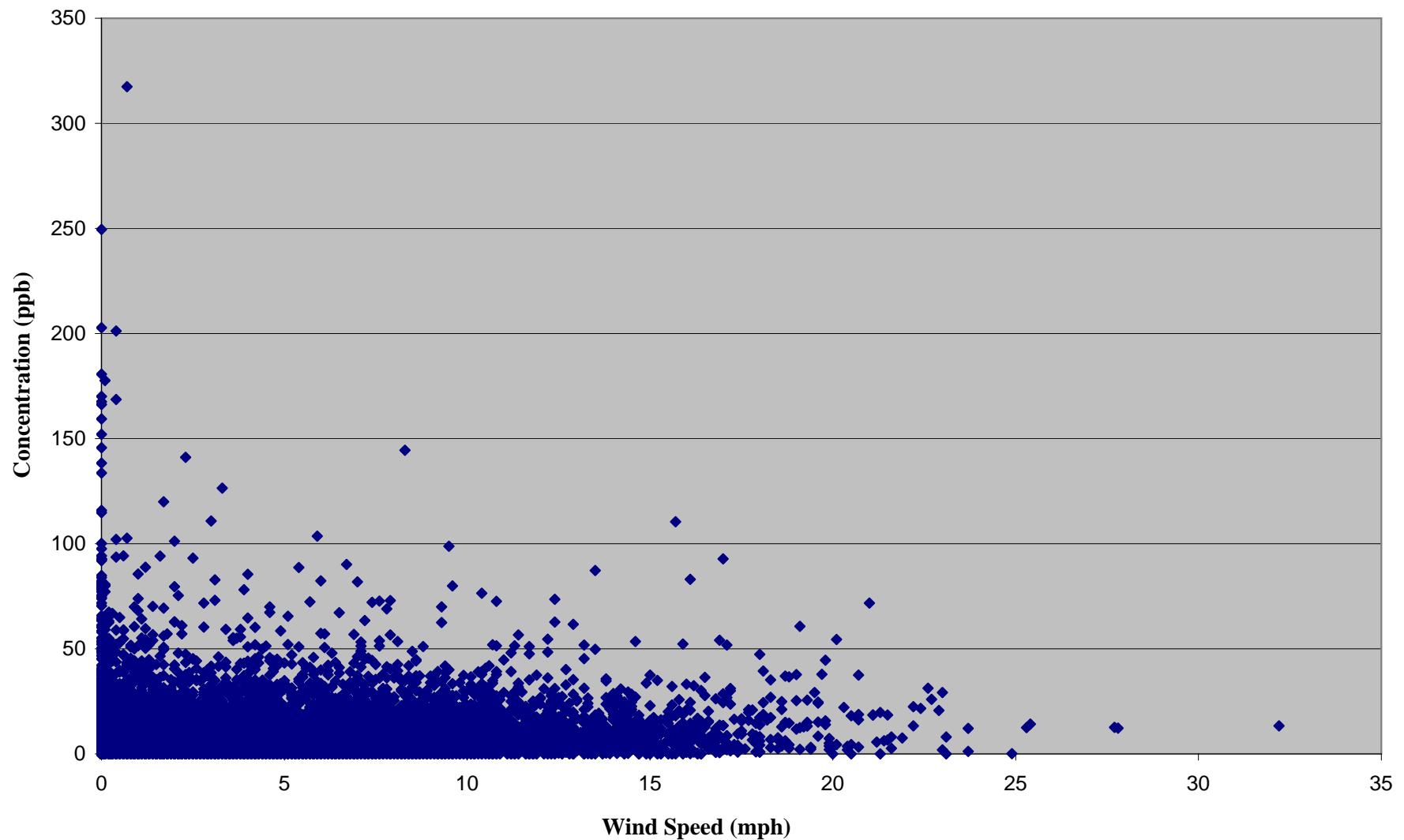
Sac City CAFO: Ammonia vs Time



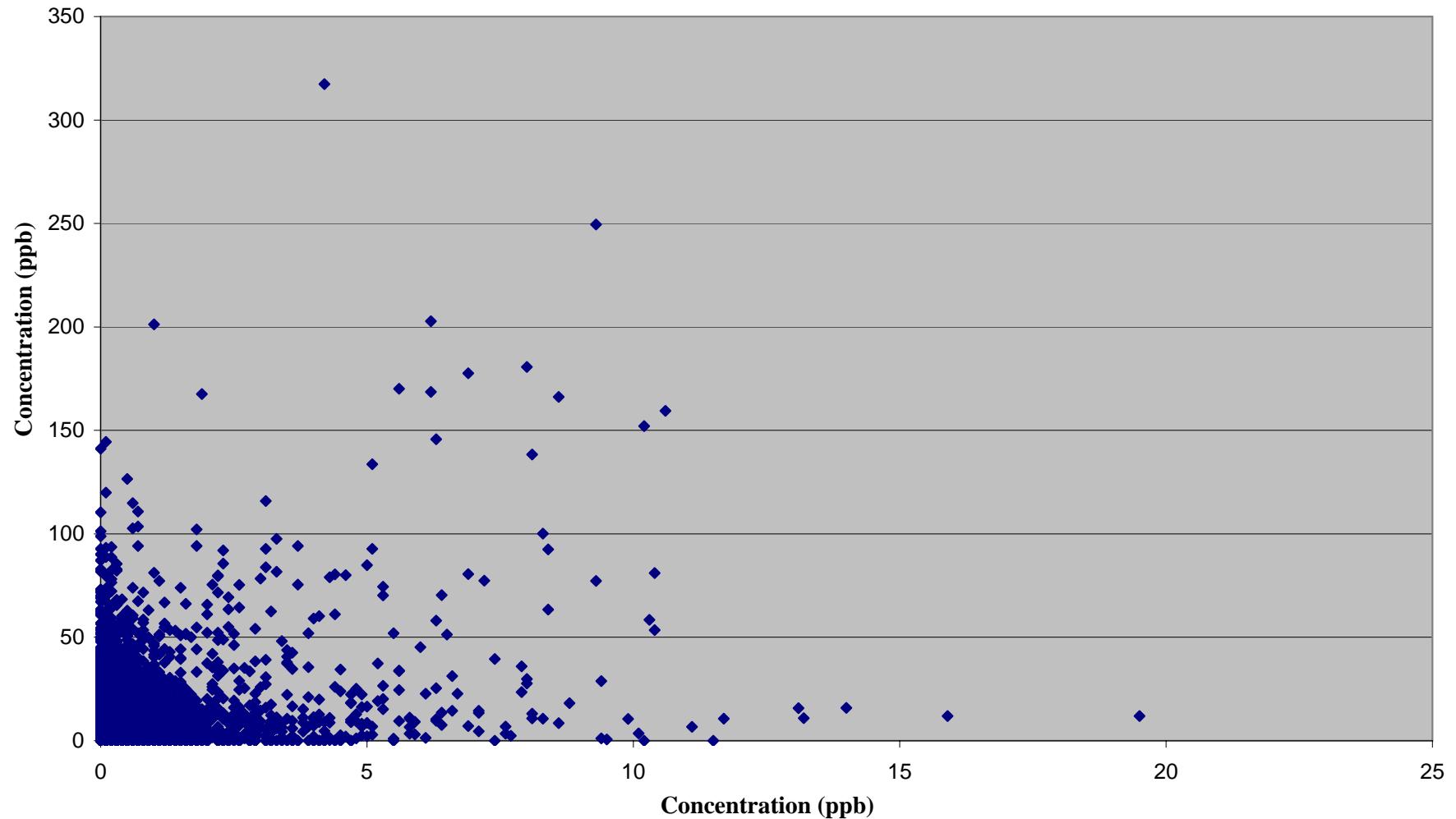
Sac City CAFO: Hydrogen Sulfide vs Wind Speed



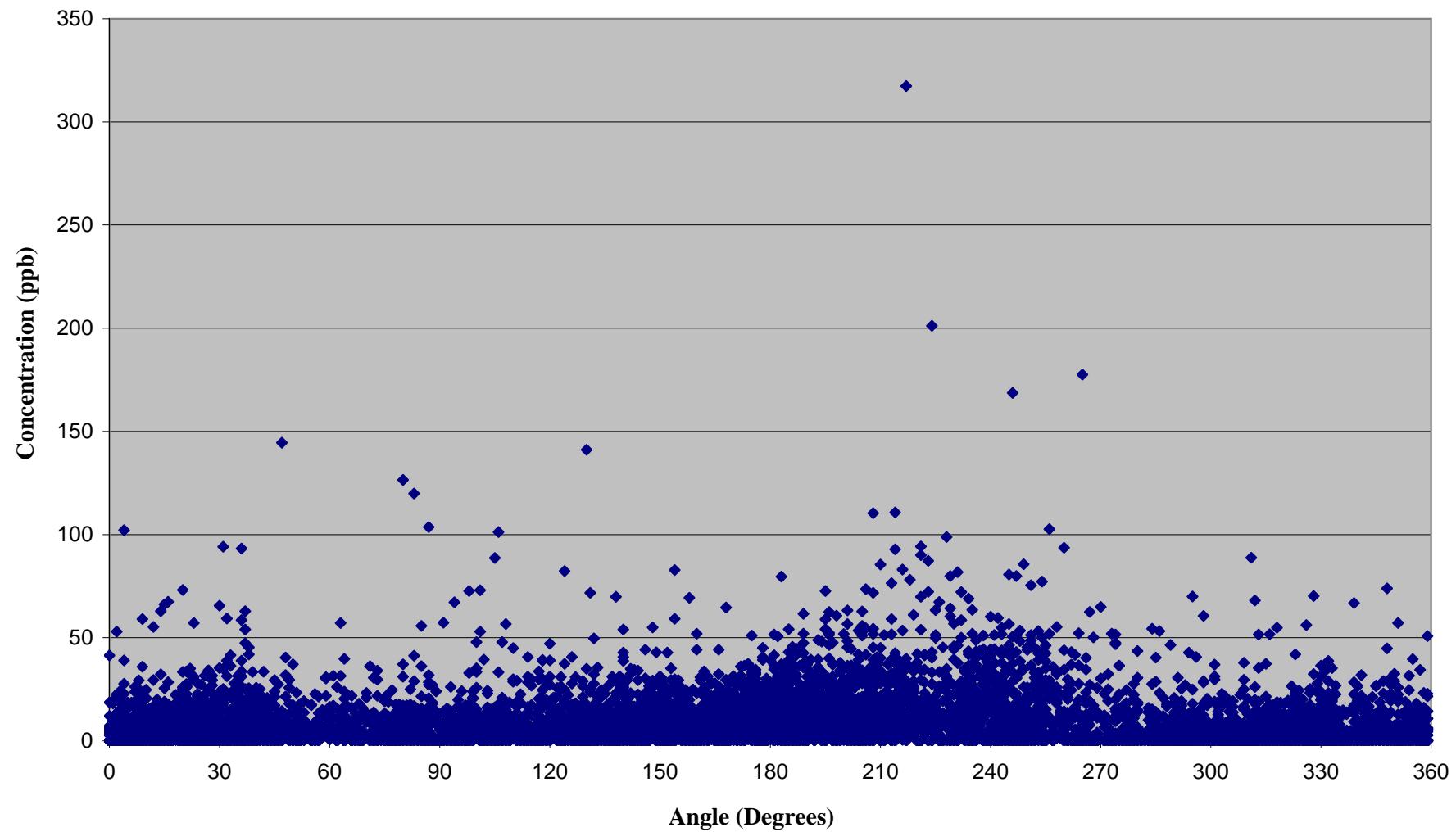
Sac City CAFO: Ammonia vs Wind Speed



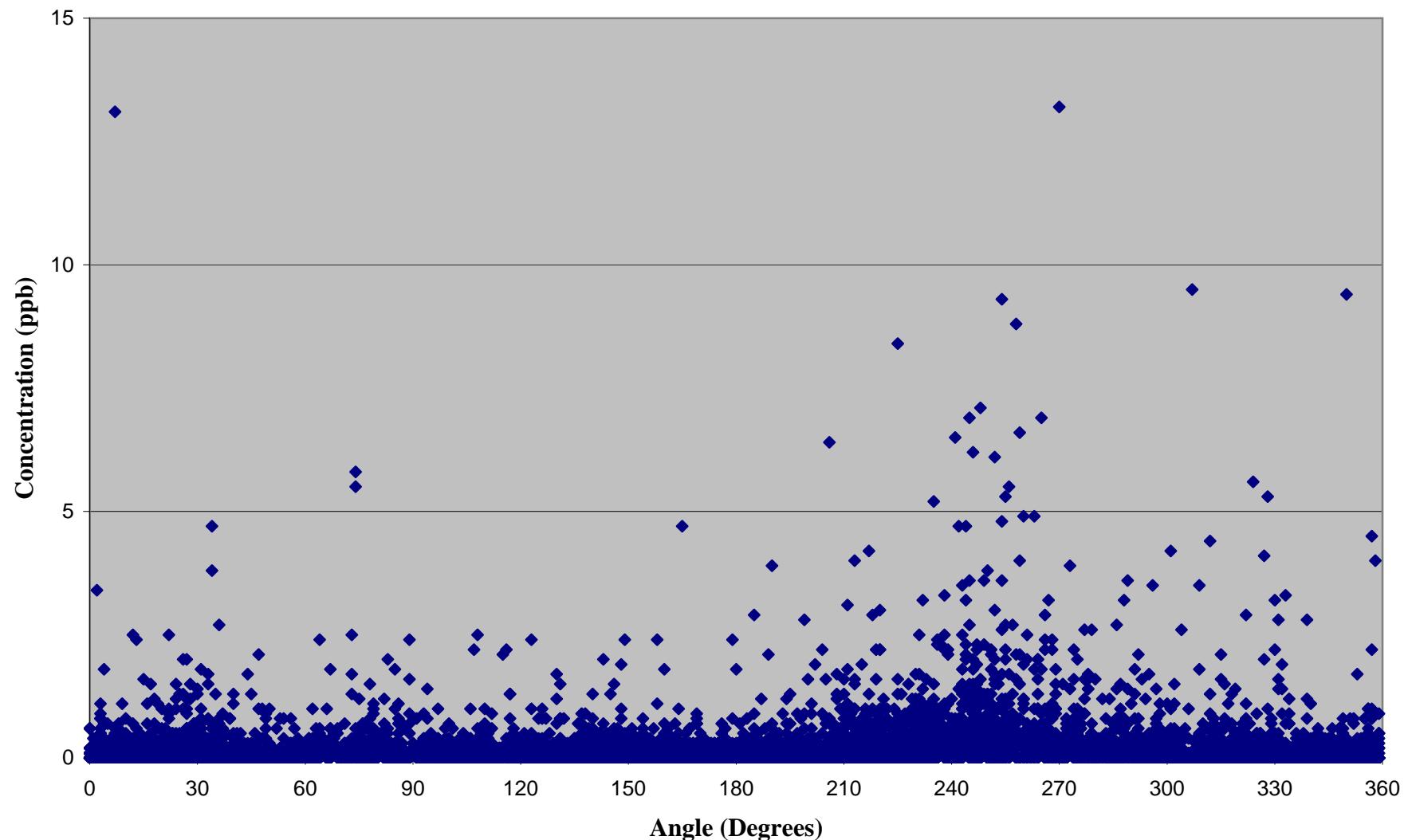
Sac City CAFO: Ammonia vs Hydrogen Sulfide



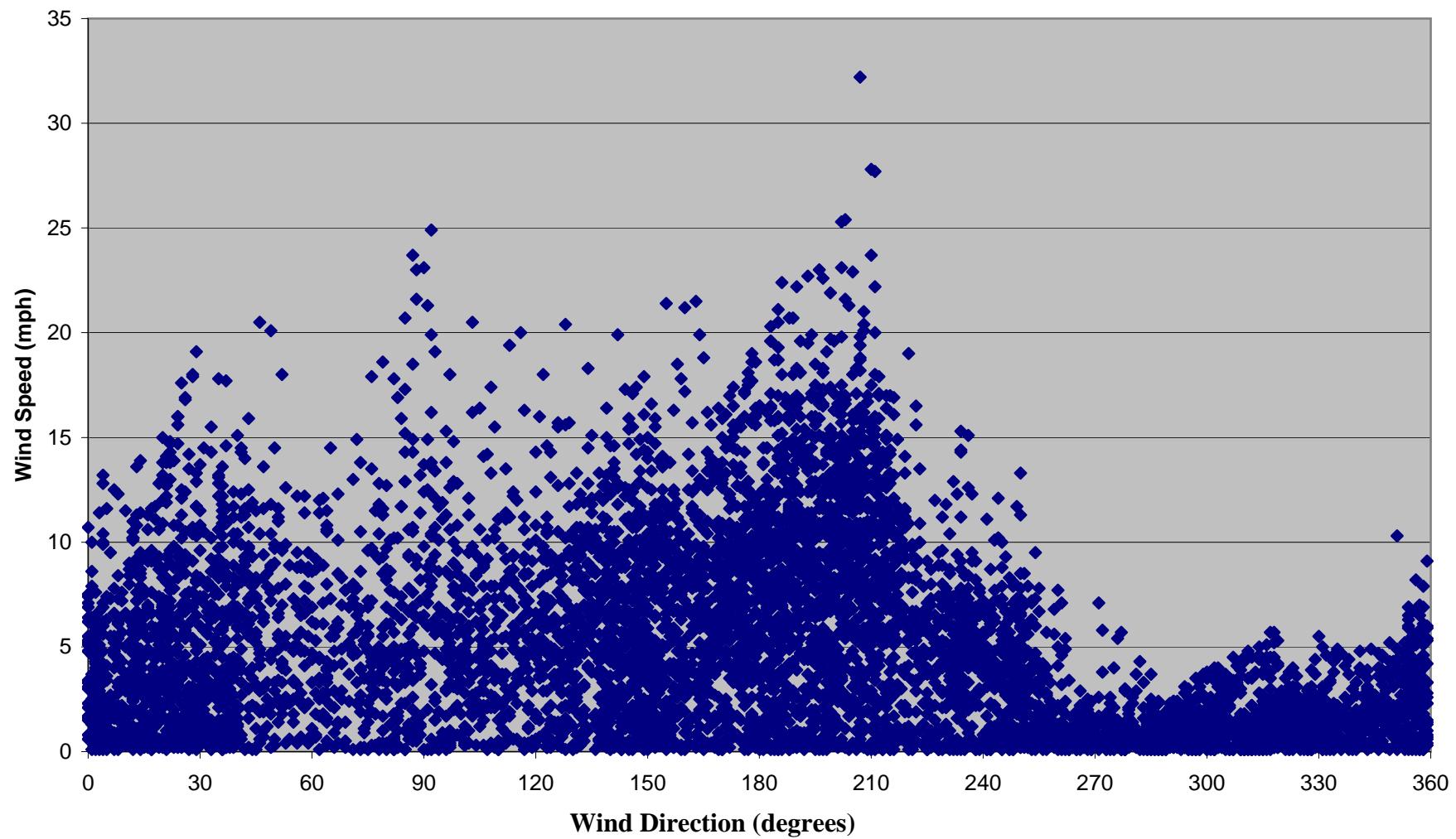
Sac City CAFO: Ammonia vs Wind Direction



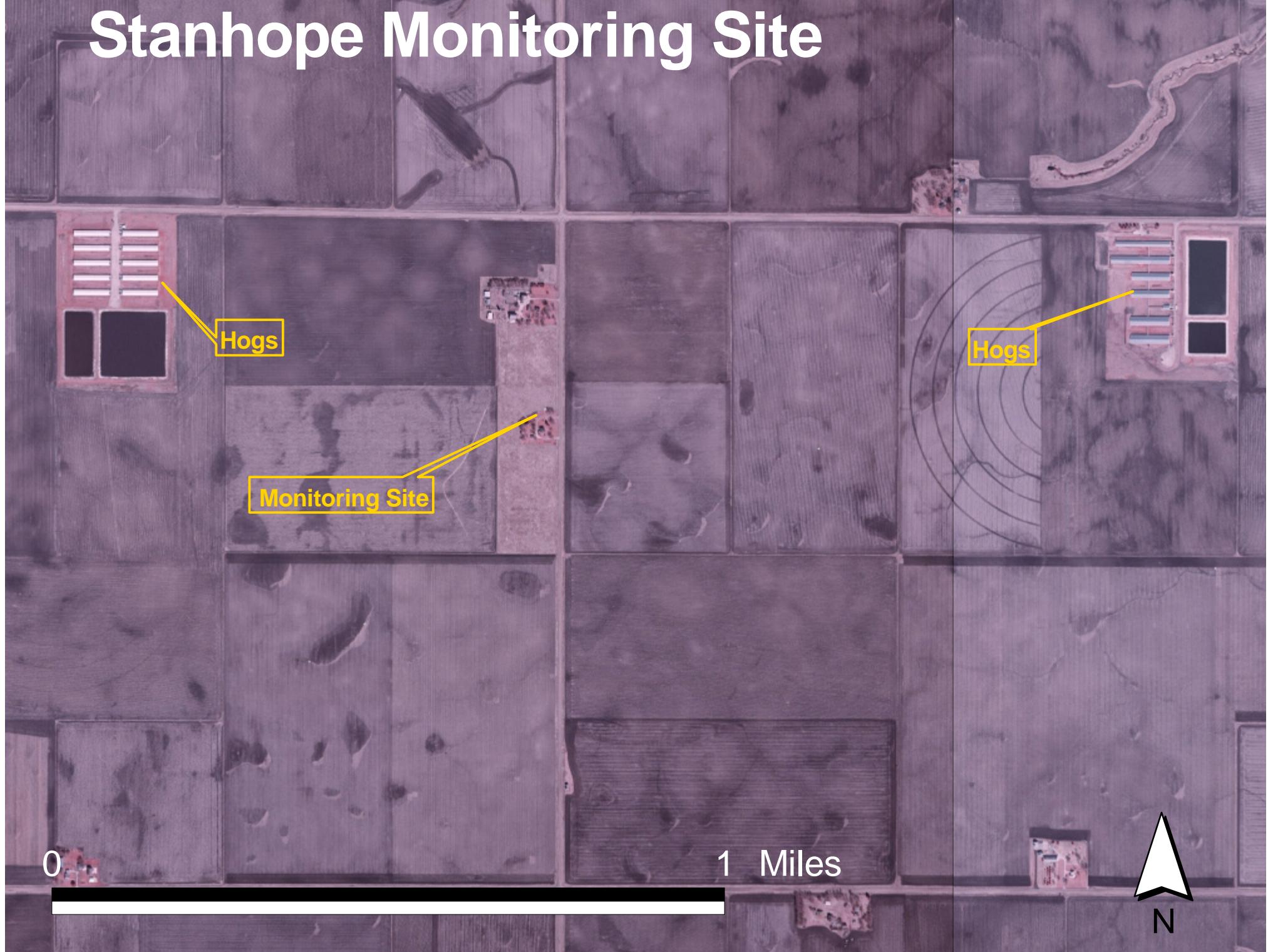
Sac City CAFO-Hydrogen Sulfide vs Wind Direction



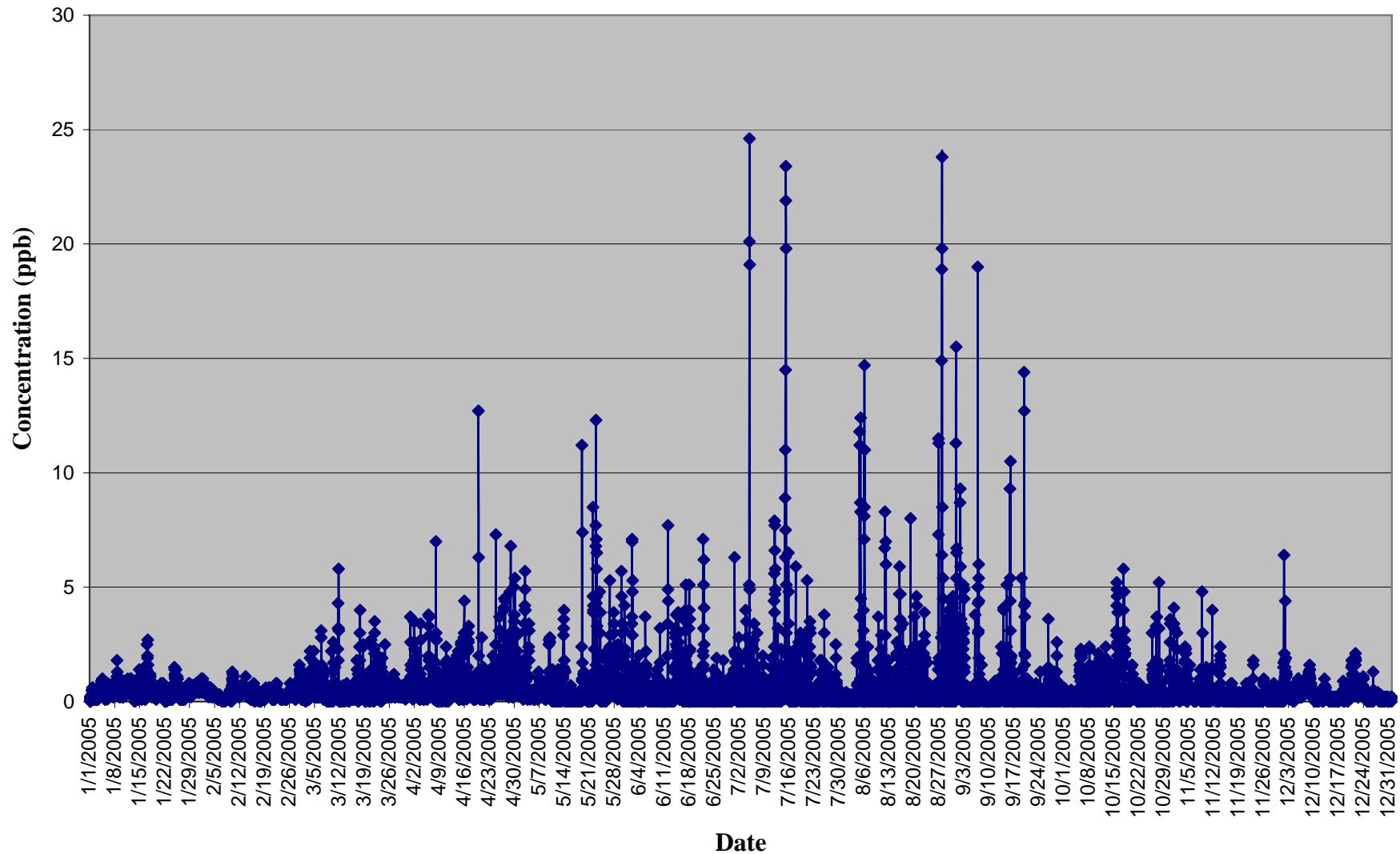
Sac City CAFO: Wind Speed vs Wind Direction



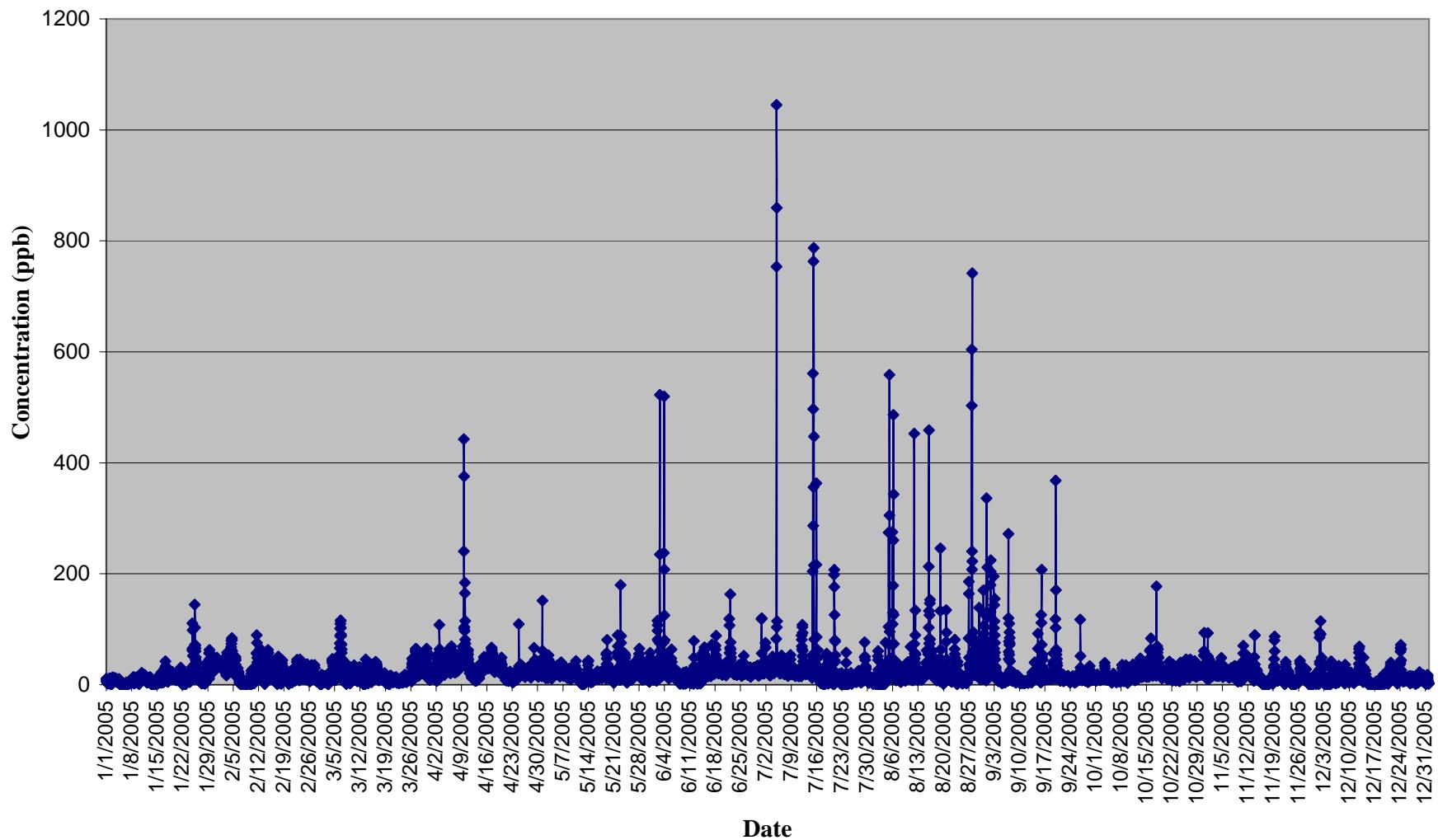
Stanhope Monitoring Site



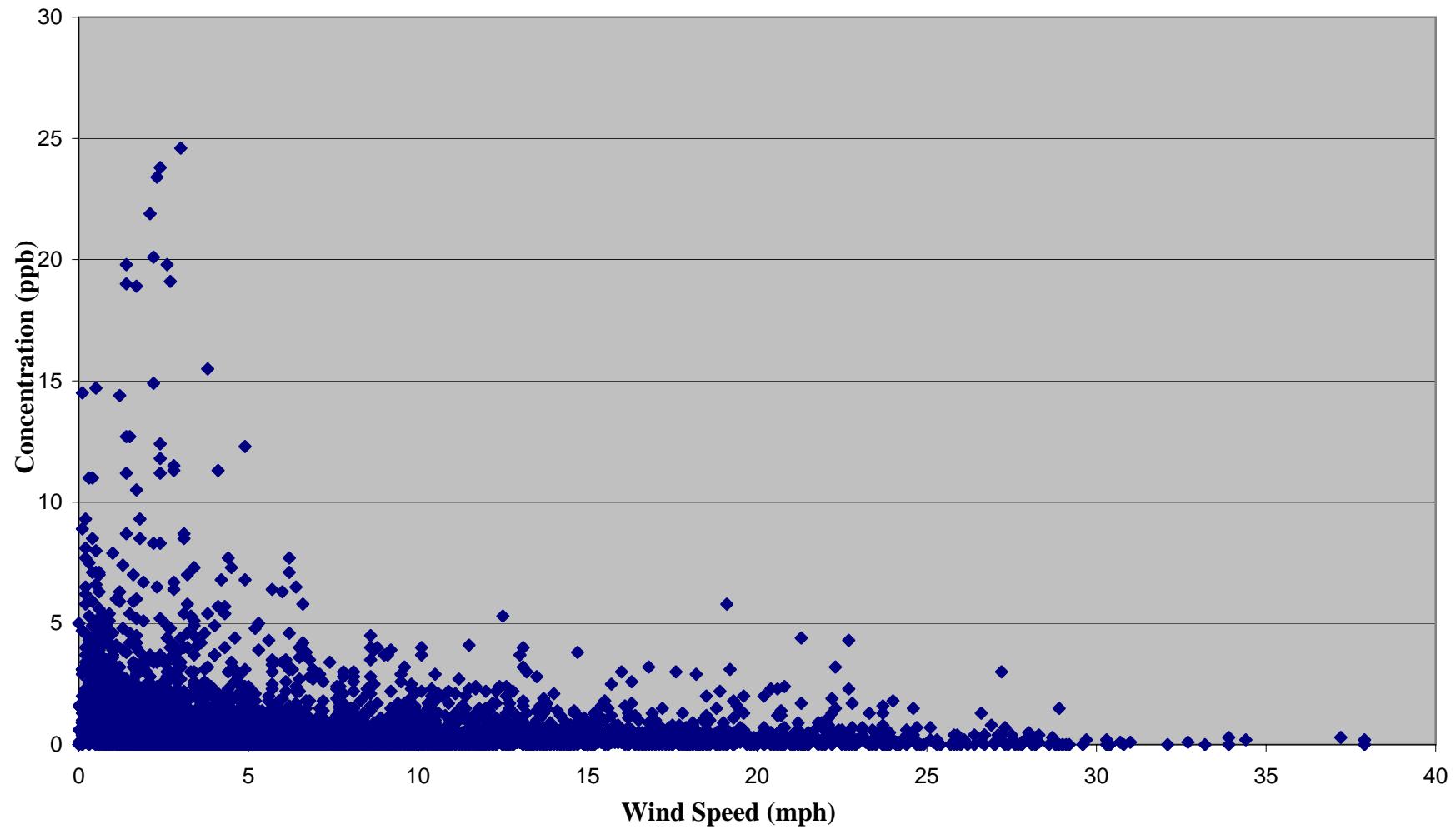
Stanhope CAFO: Hydrogen Sulfide vs Time



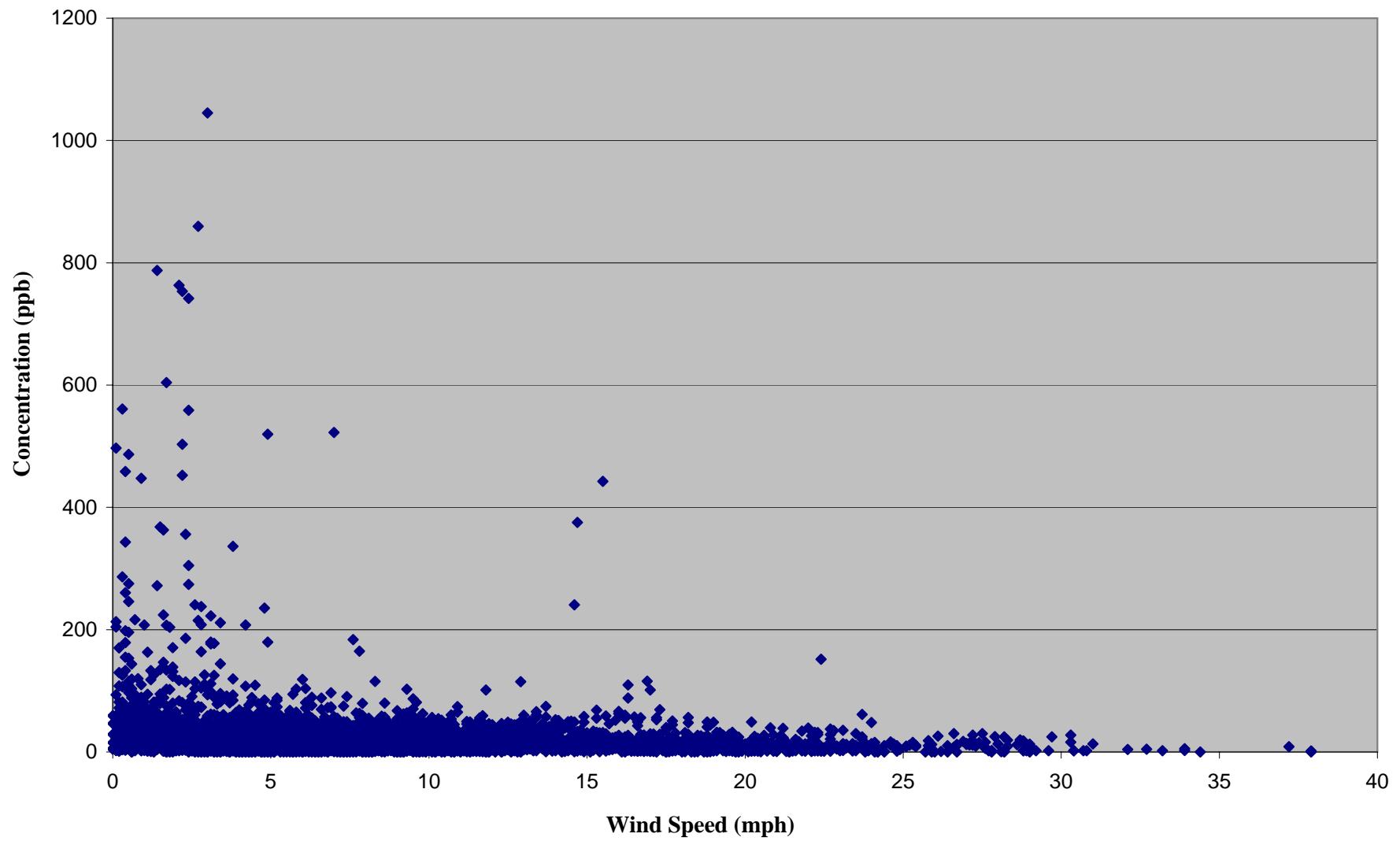
Stanhope CAFO: Ammonia vs Time



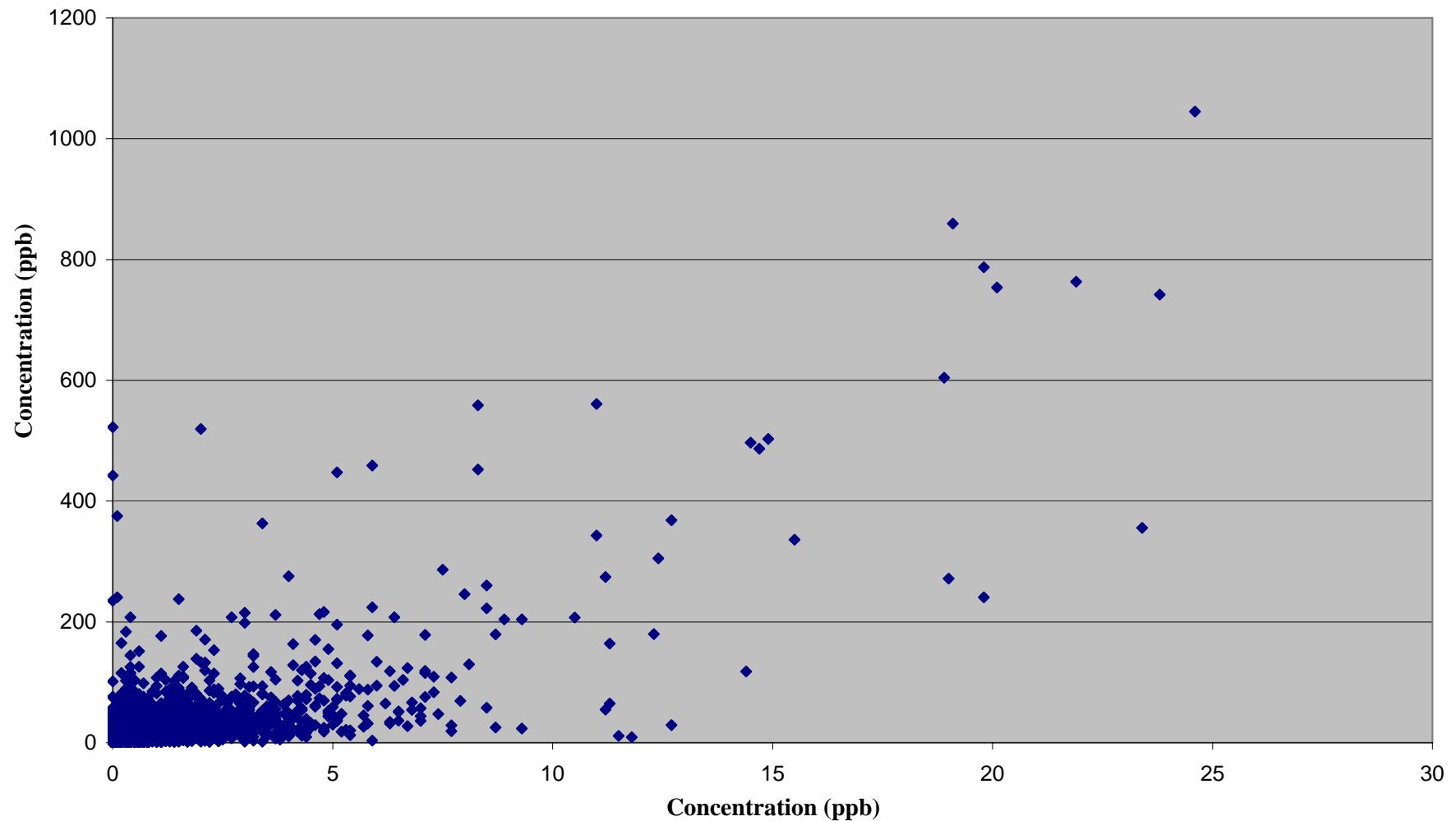
Stanhope CAFO: Hydrogen Sulfide vs Wind Speed



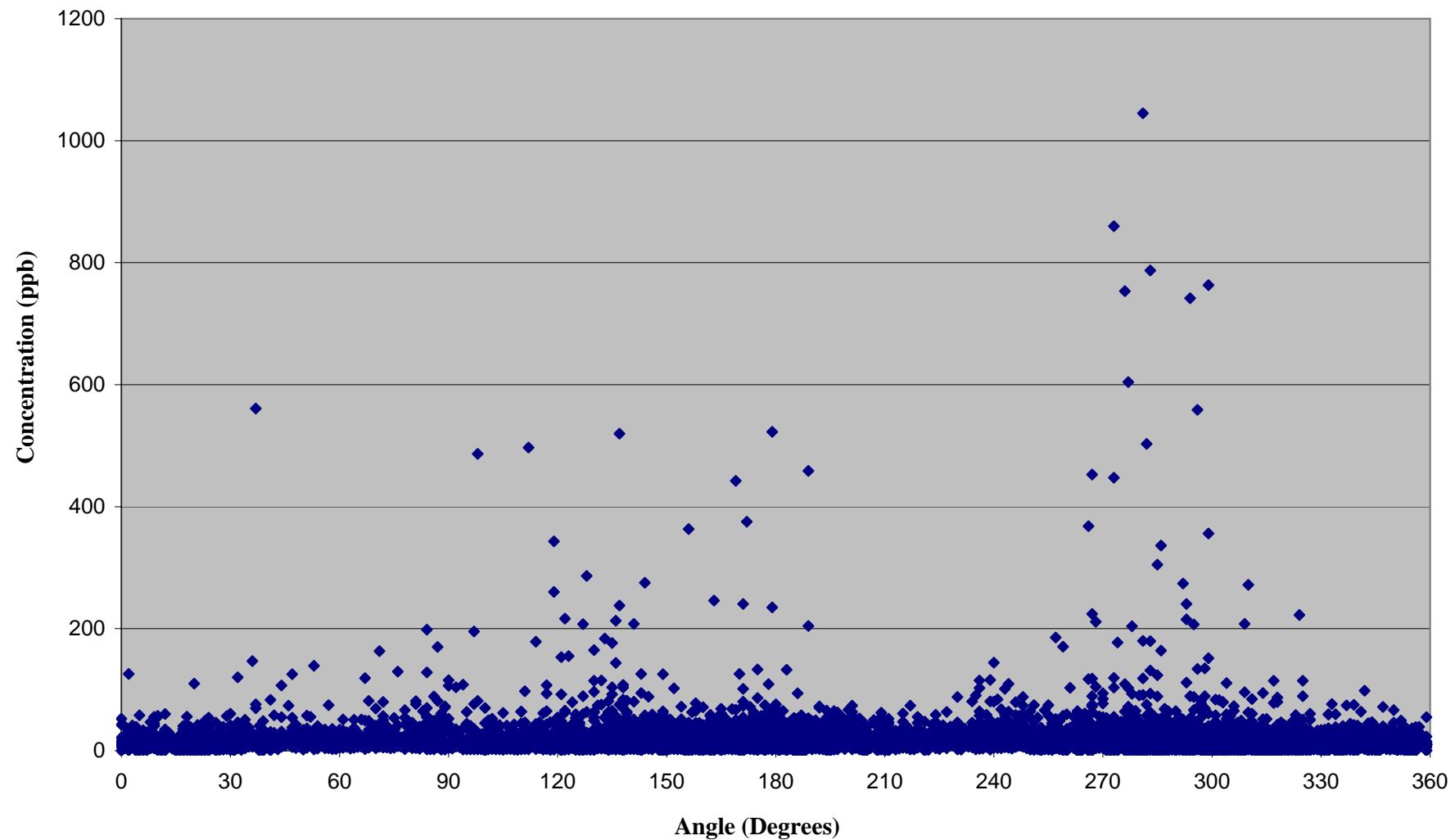
Stanhope CAFO: Ammonia vs Wind Speed



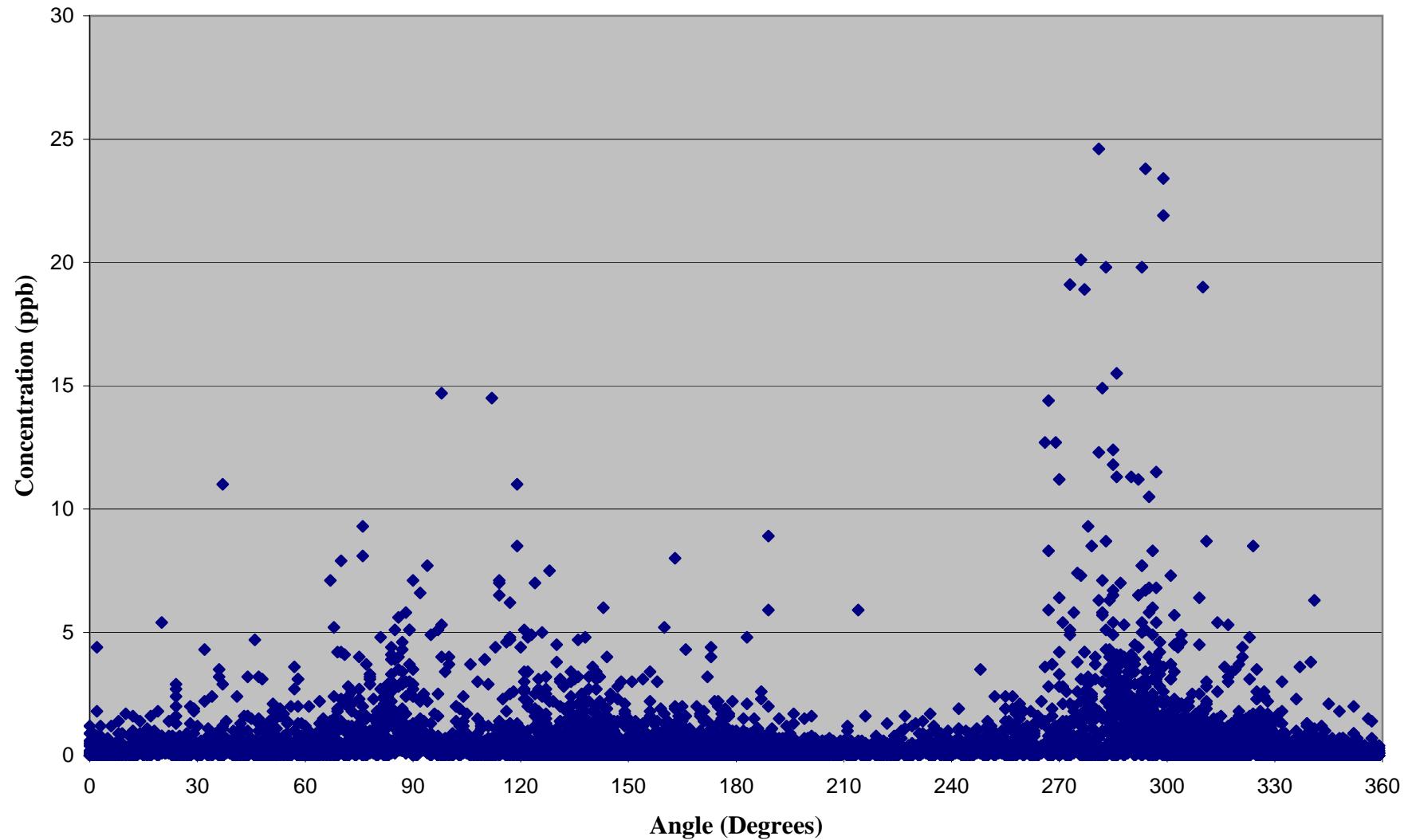
Stanhope CAFO: Ammonia vs Hydrogen Sulfide



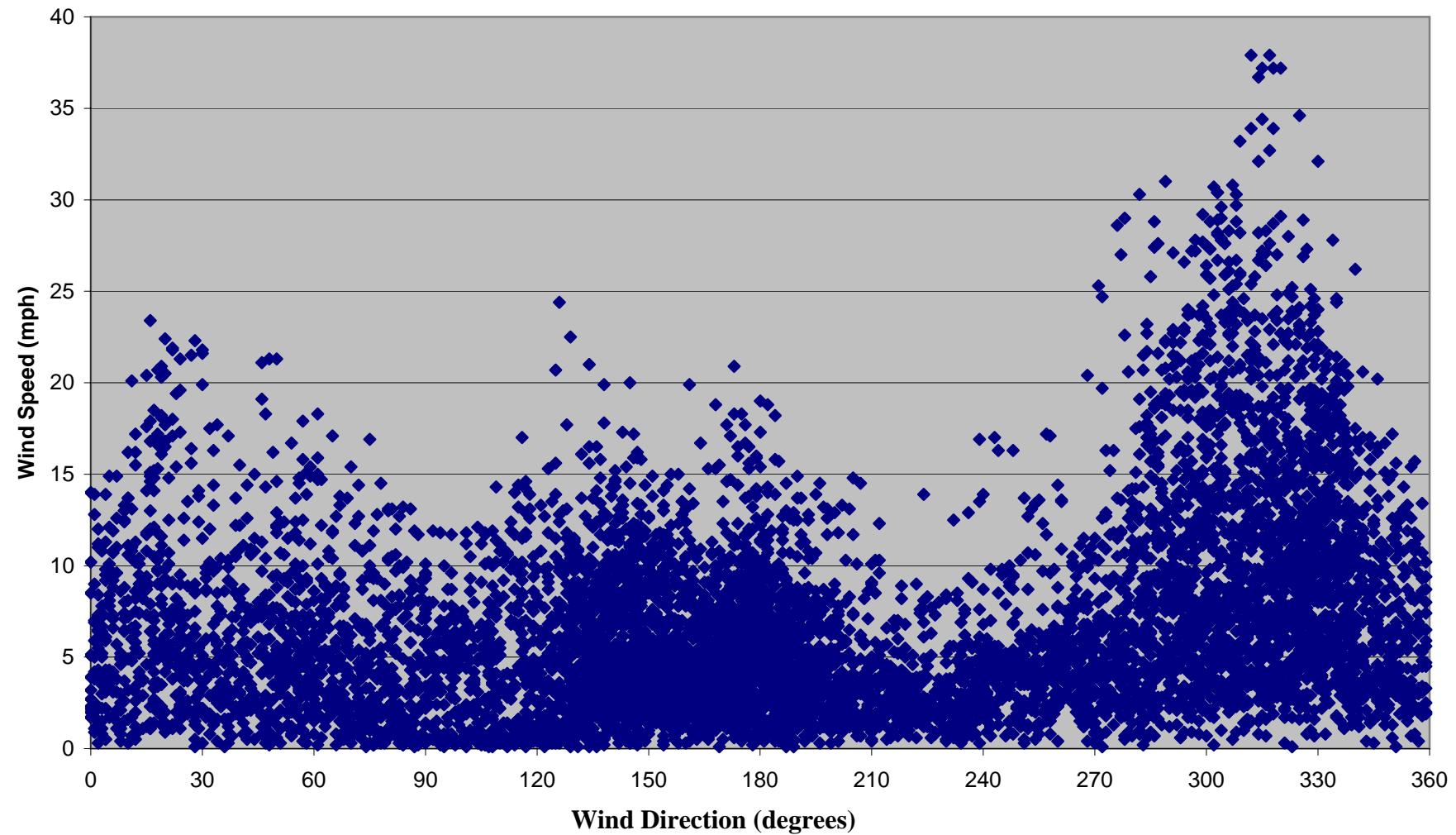
Stanhope CAFO: Ammonia vs Wind Direction



Stanhope CAFO-Hydrogen Sulfide vs Wind Direction



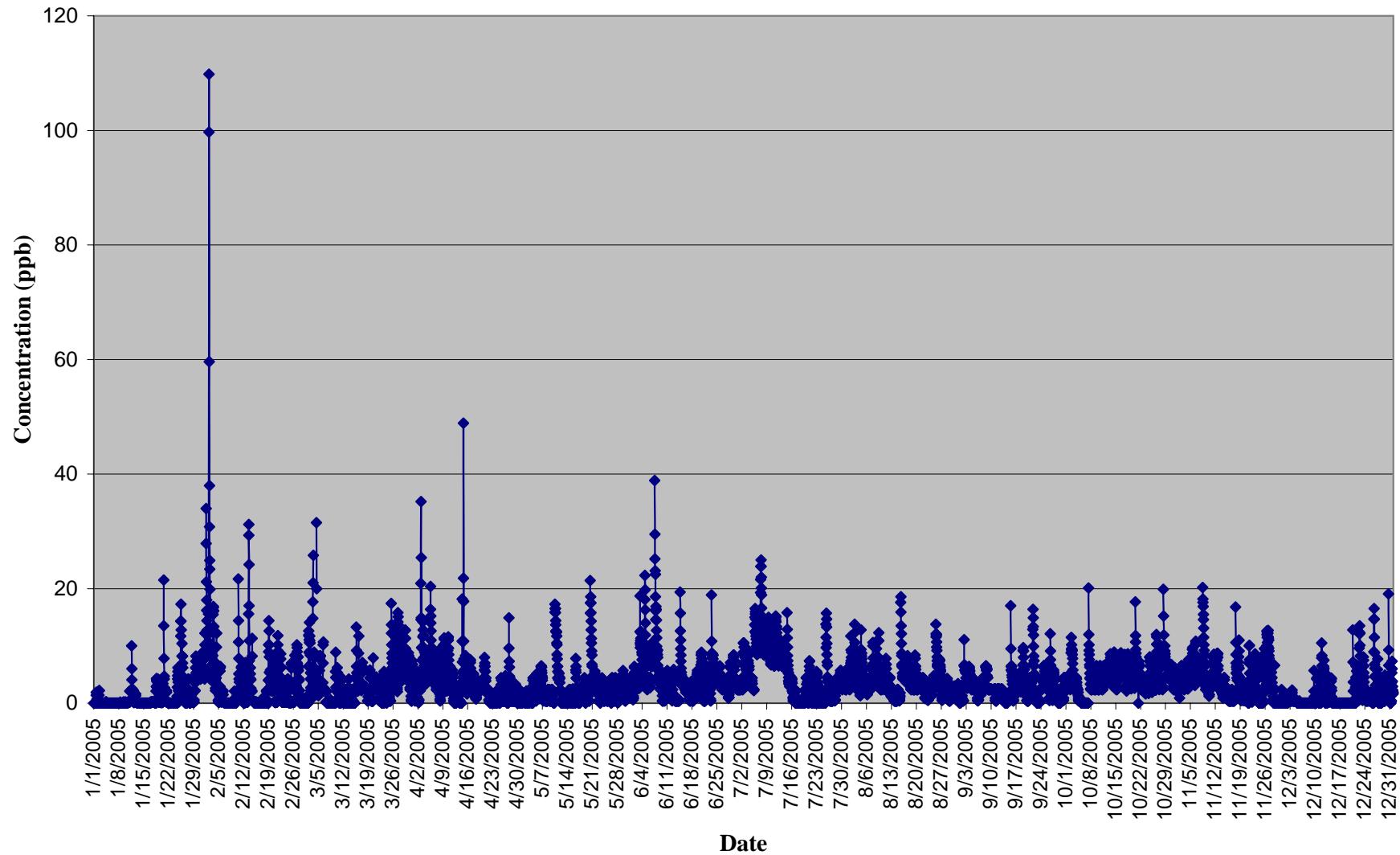
Stanhope CAFO: Wind Speed vs Wind Direction



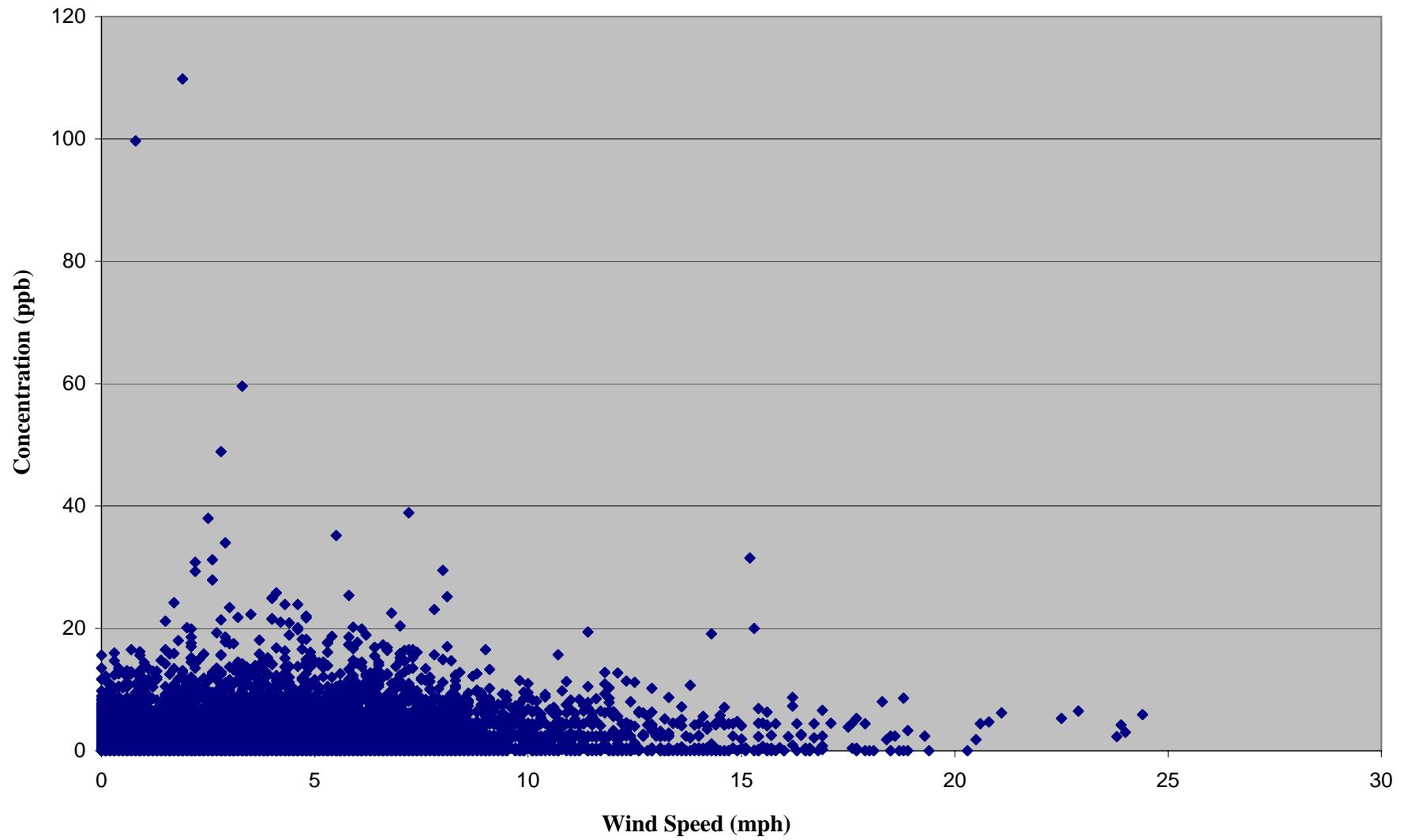
Viking Lake State Park Monitoring Site



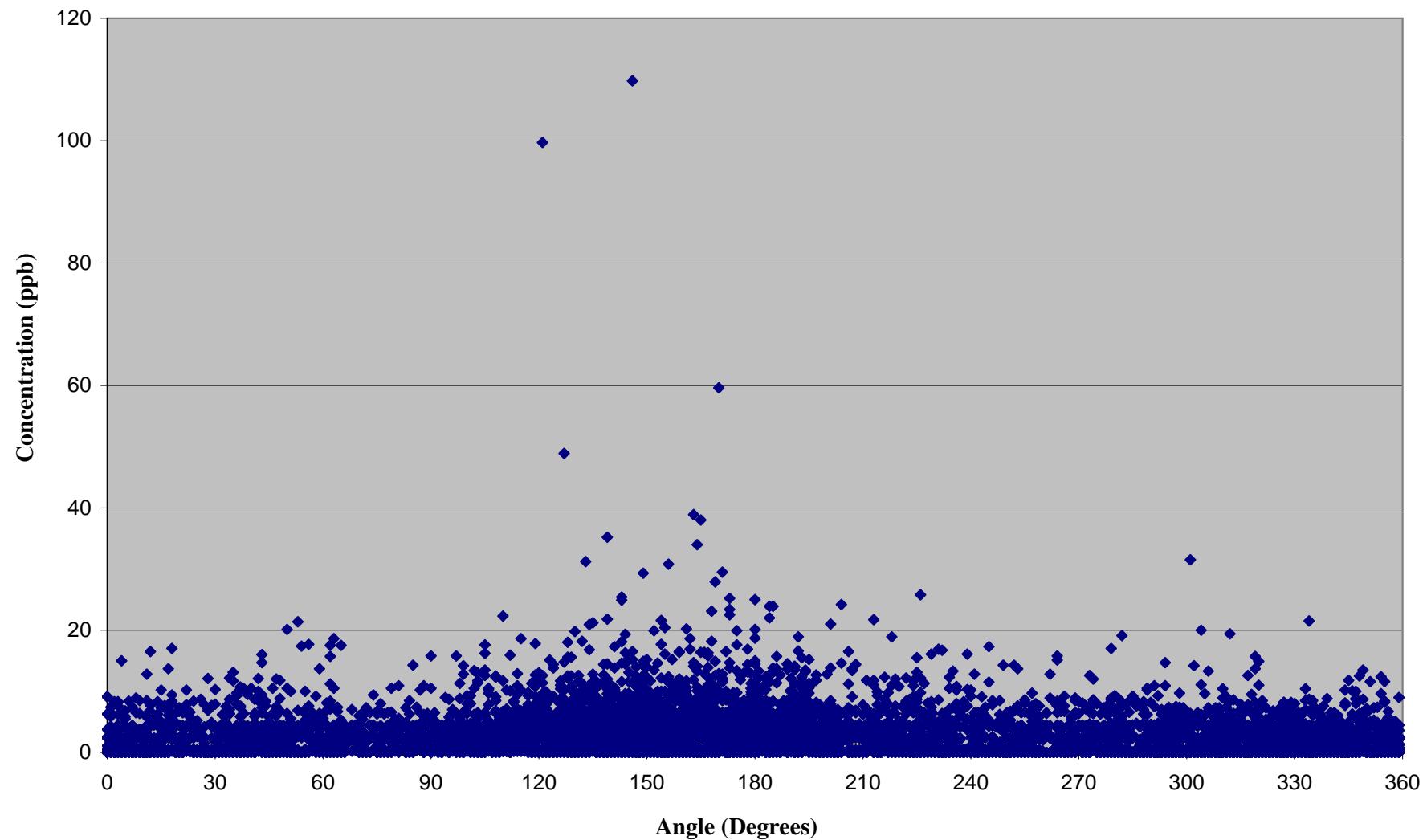
Viking Lake: Ammonia vs Time



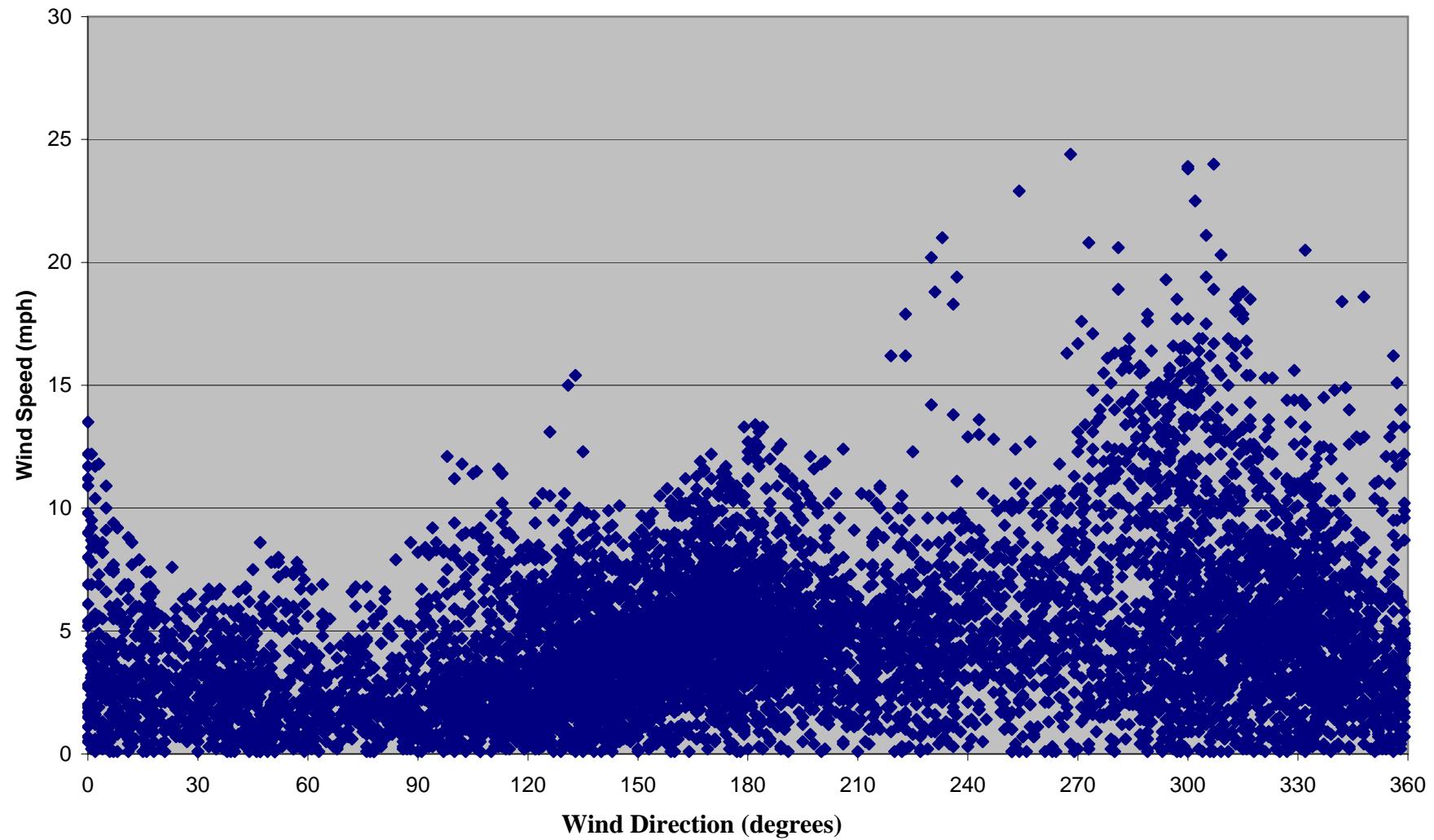
Viking Lake: Ammonia vs Wind Speed



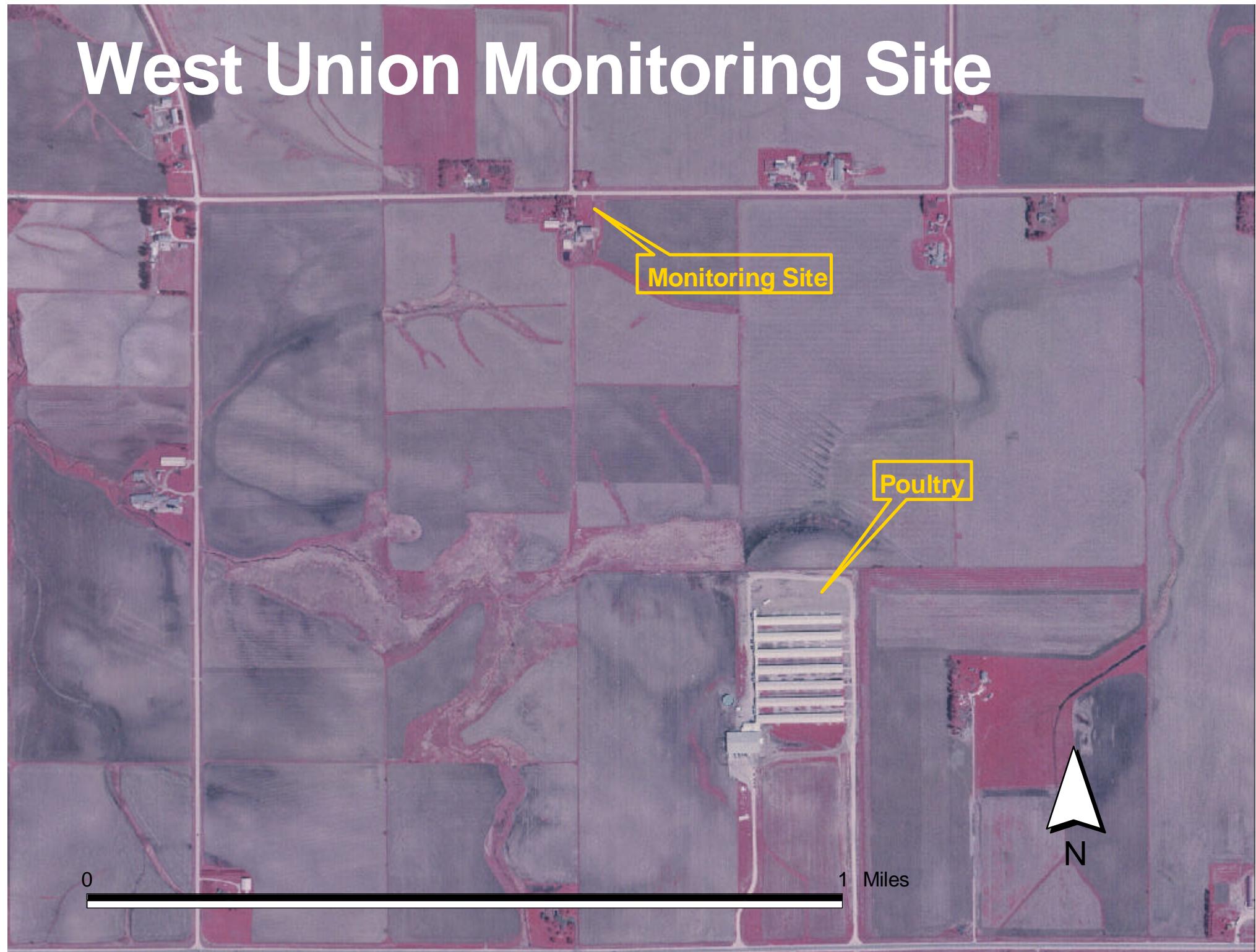
Viking Lake: Ammonia vs Wind Direction



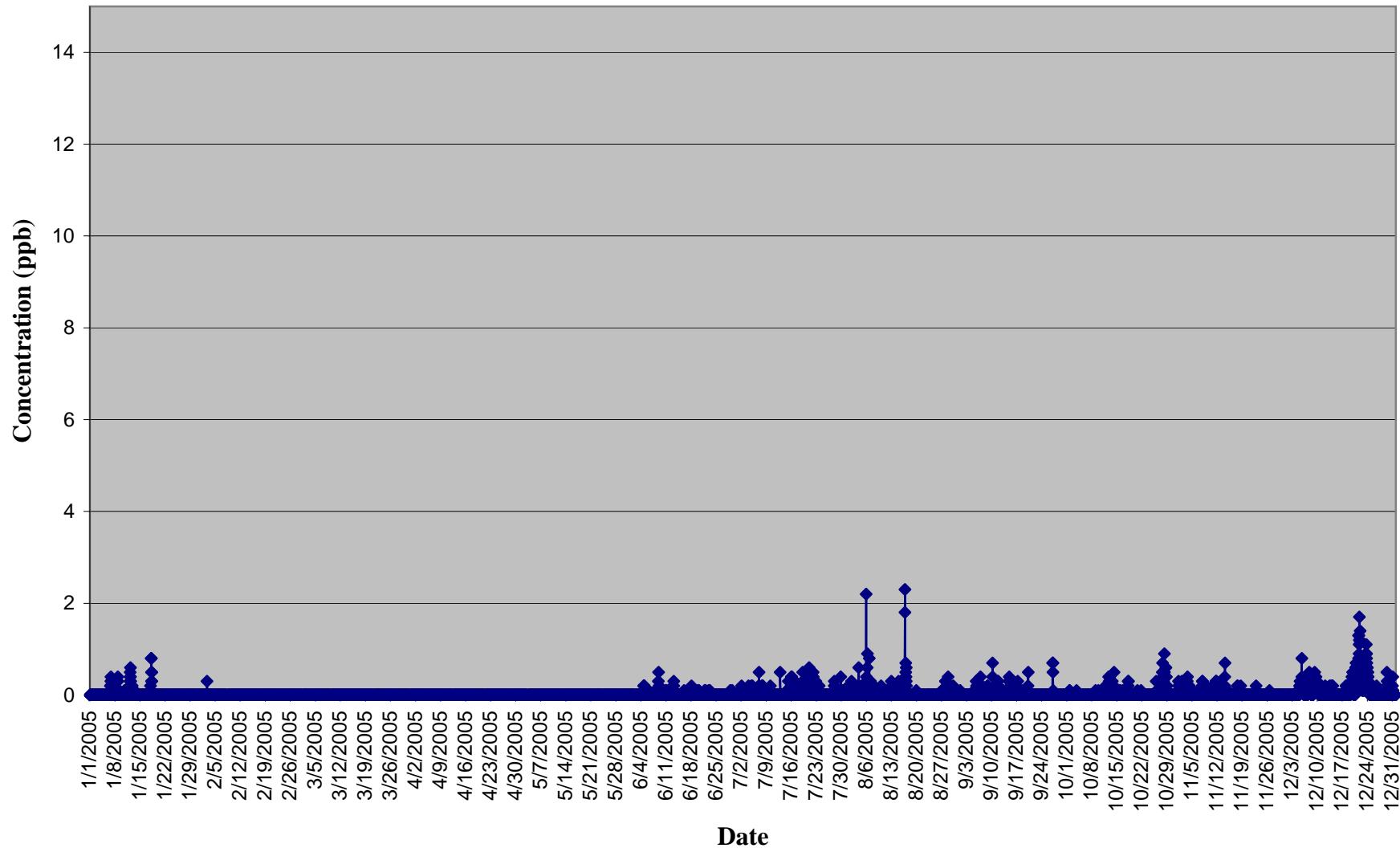
Viking Lake: Wind Speed vs Wind Direction



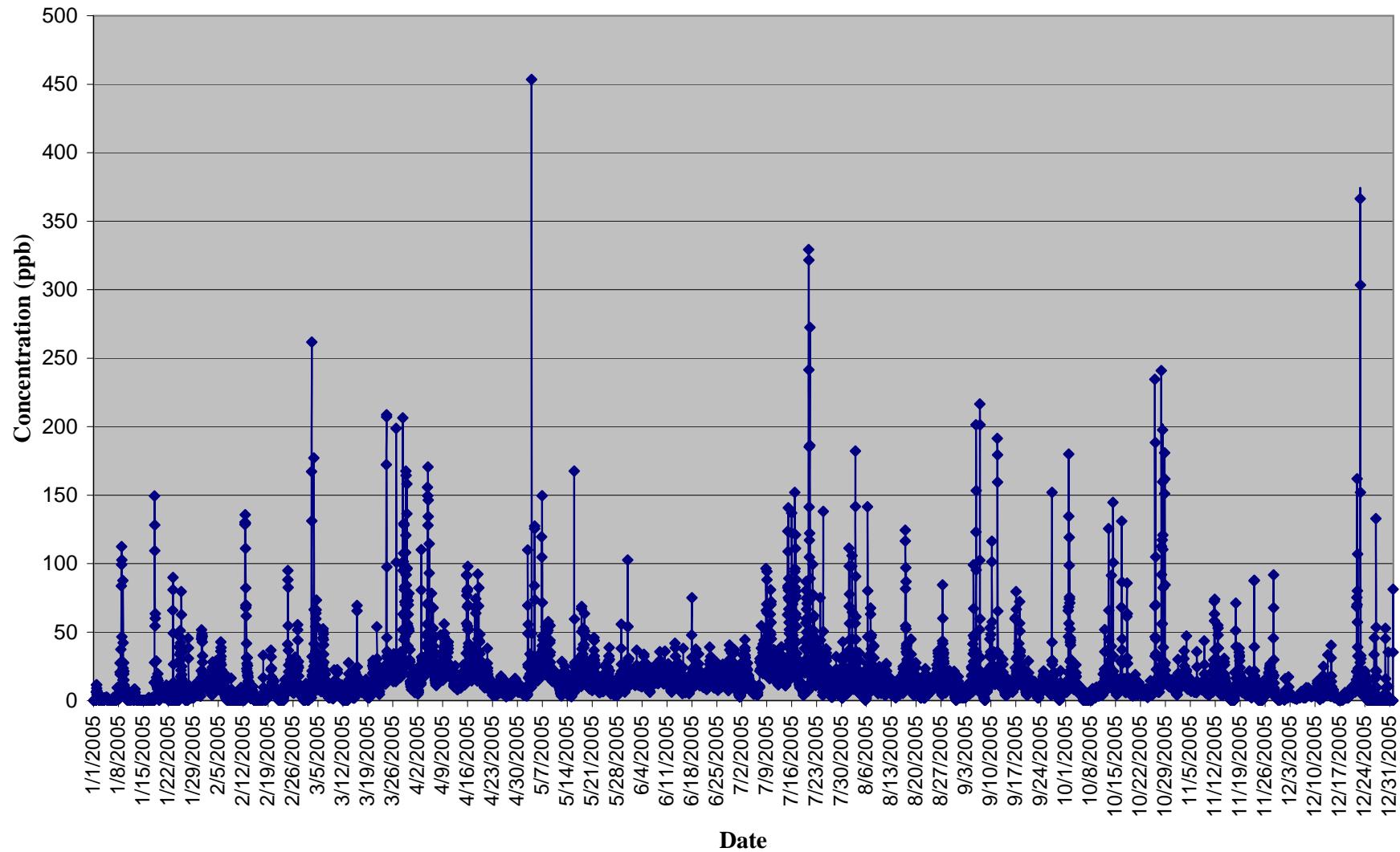
West Union Monitoring Site



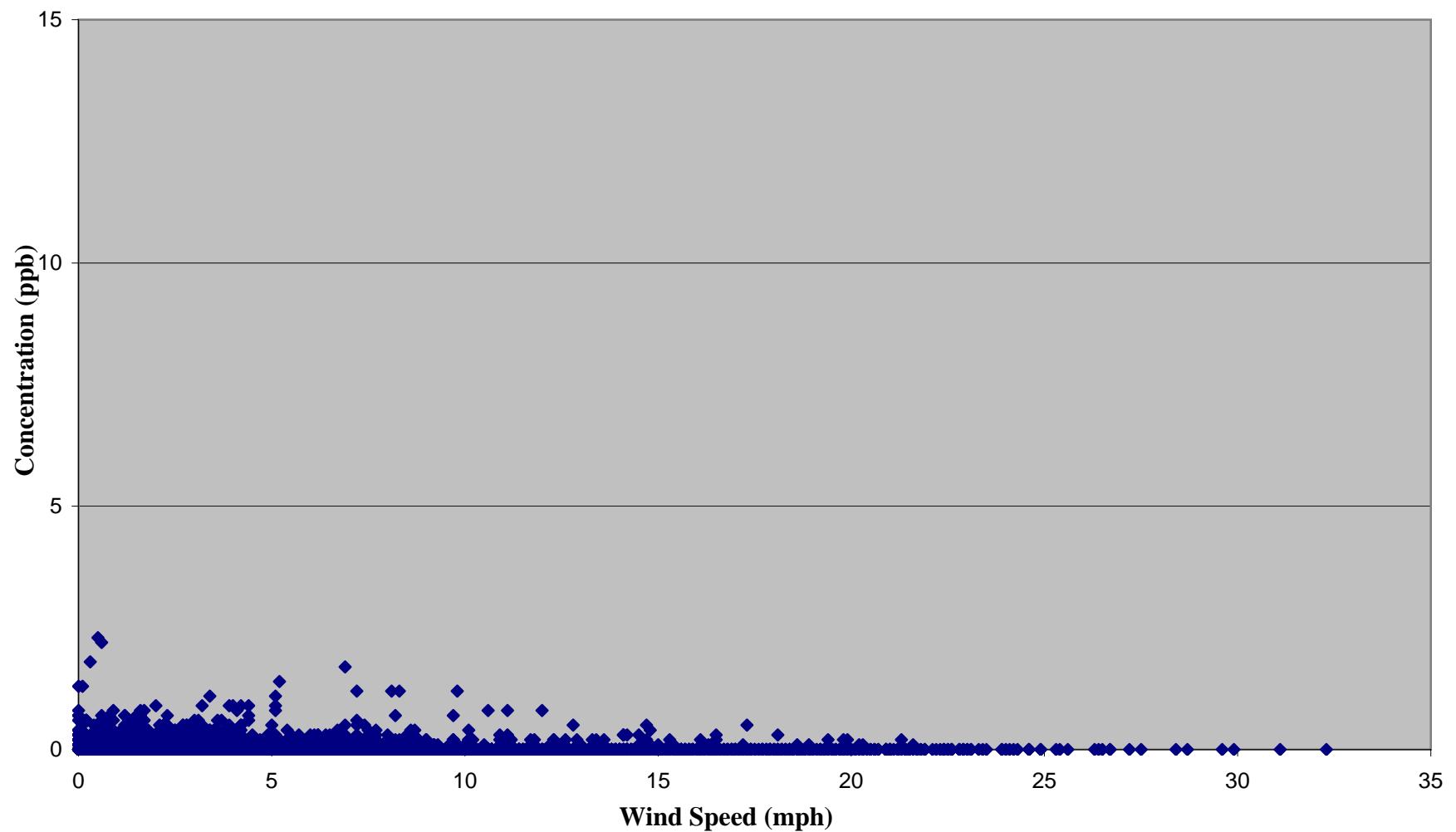
West Union CAFO: Hydrogen Sulfide vs Time



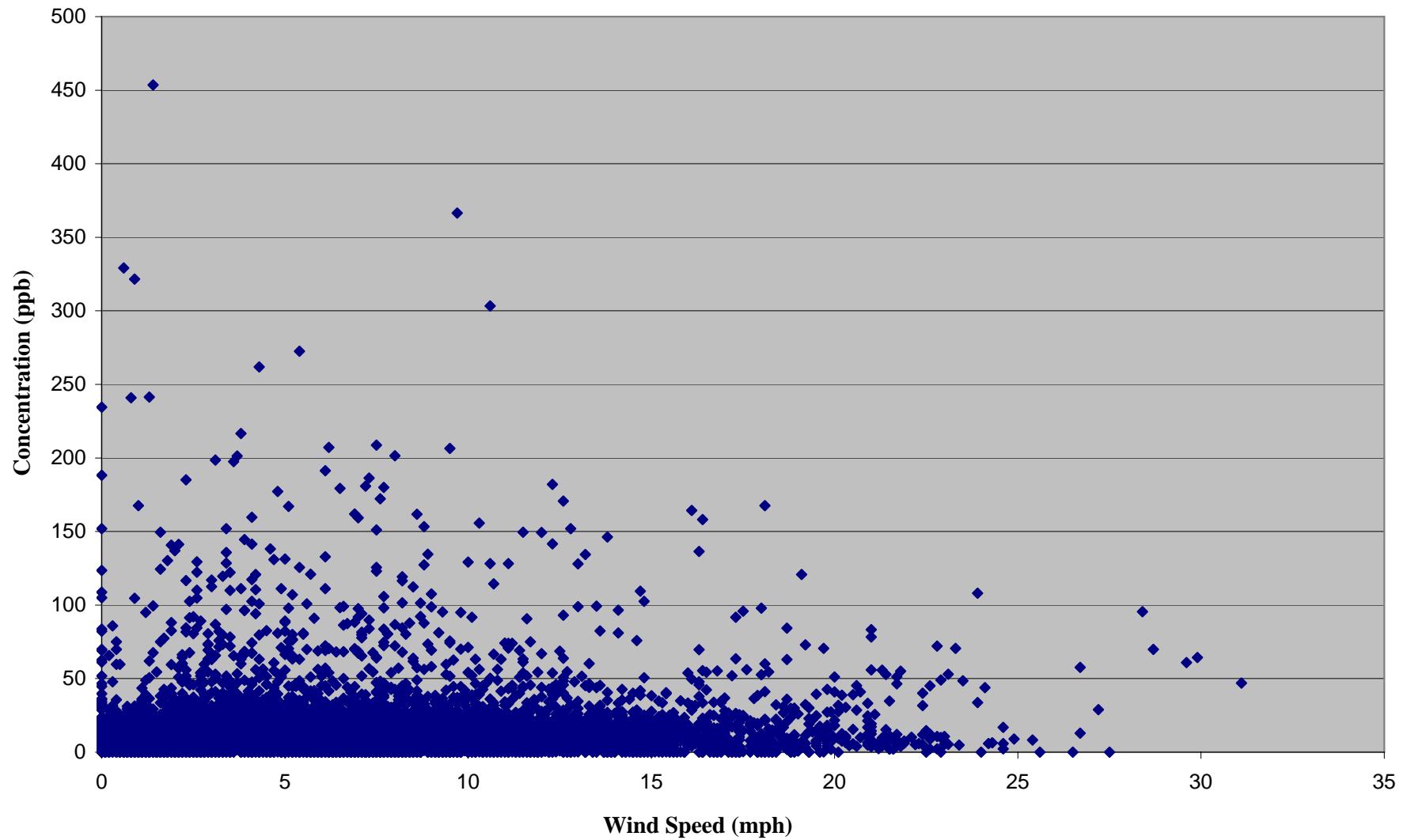
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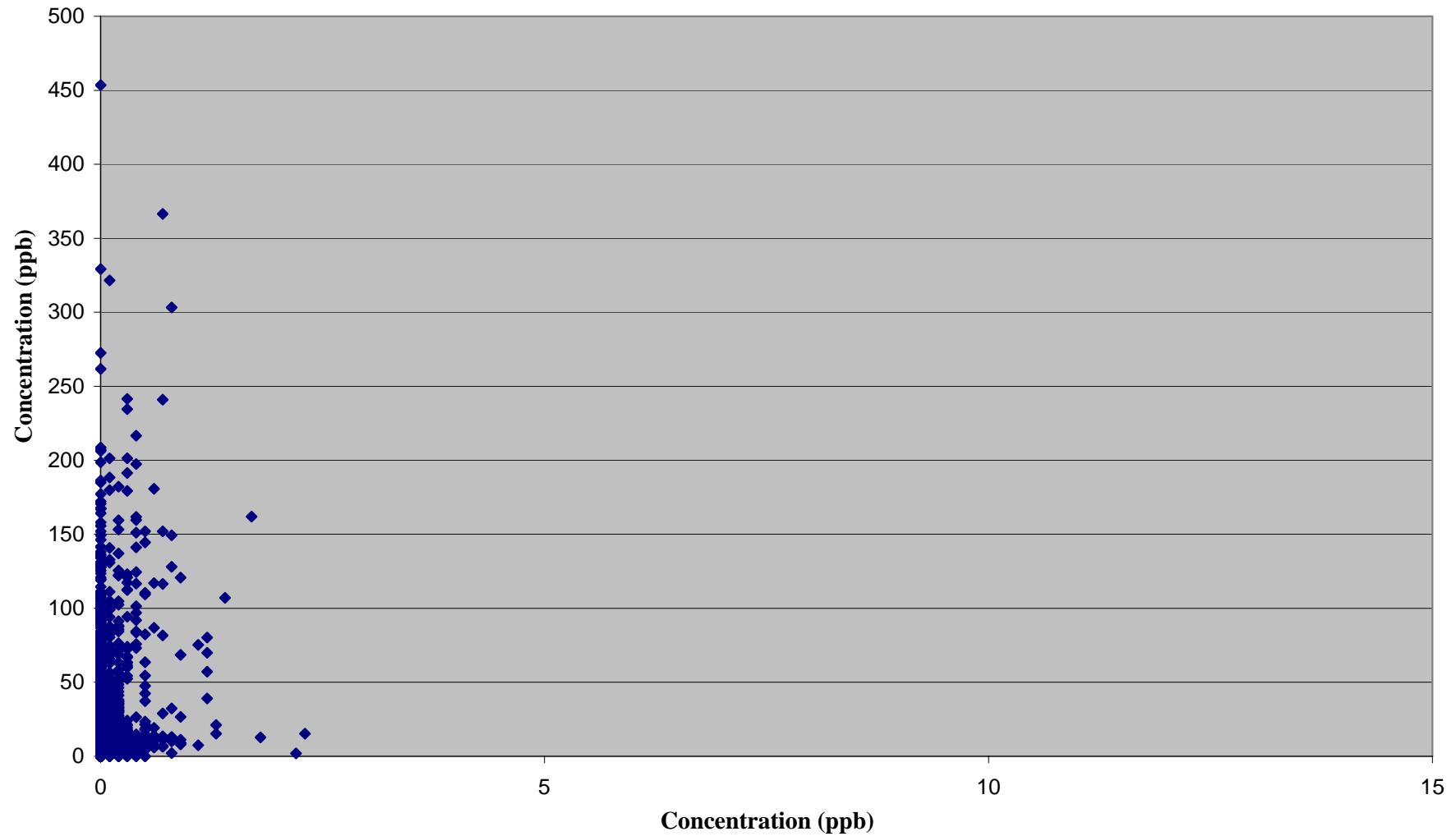
West Union CAFO: Hydrogen Sulfide vs Wind Speed



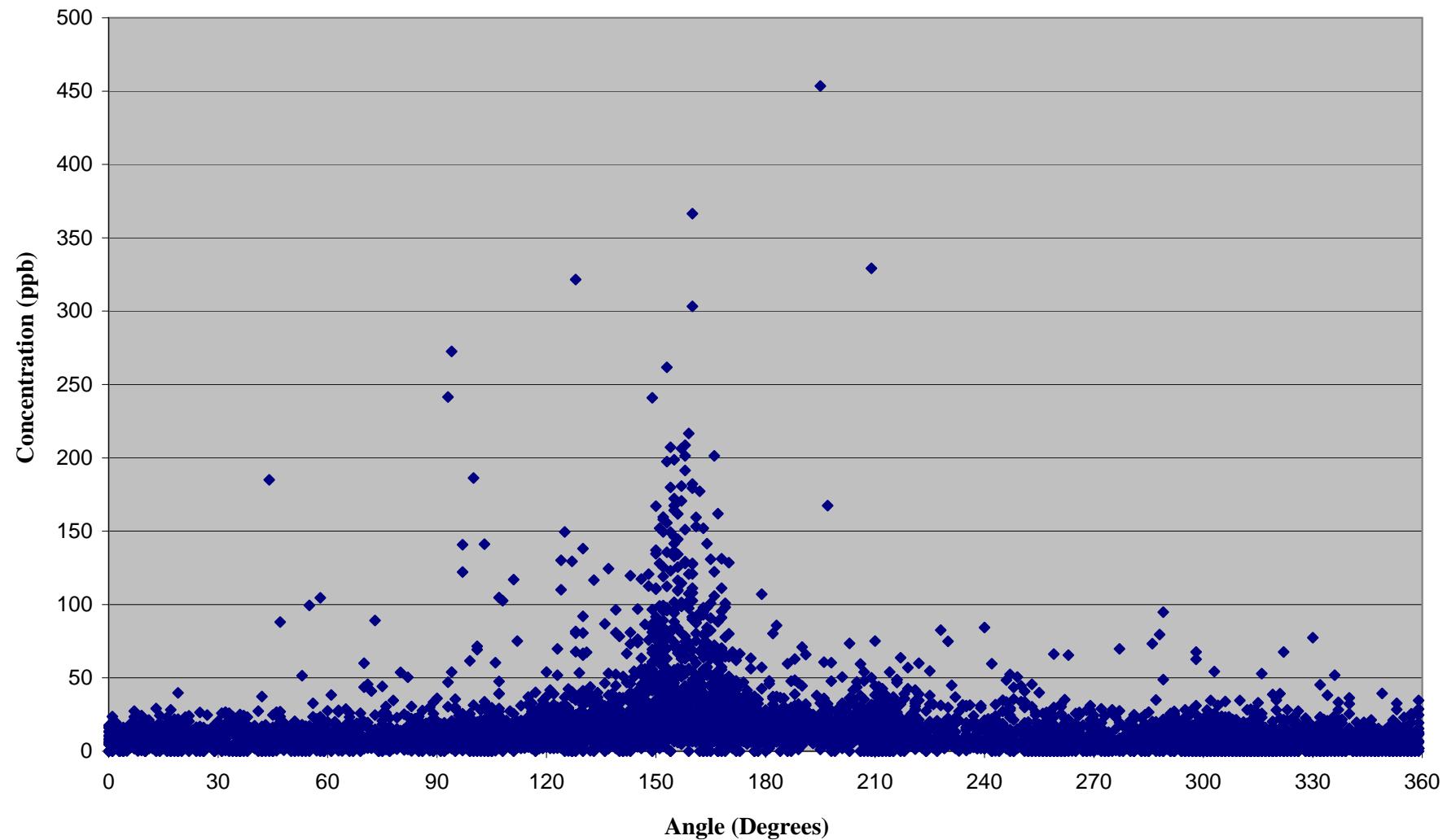
West Union CAFO: Ammonia vs Wind Speed



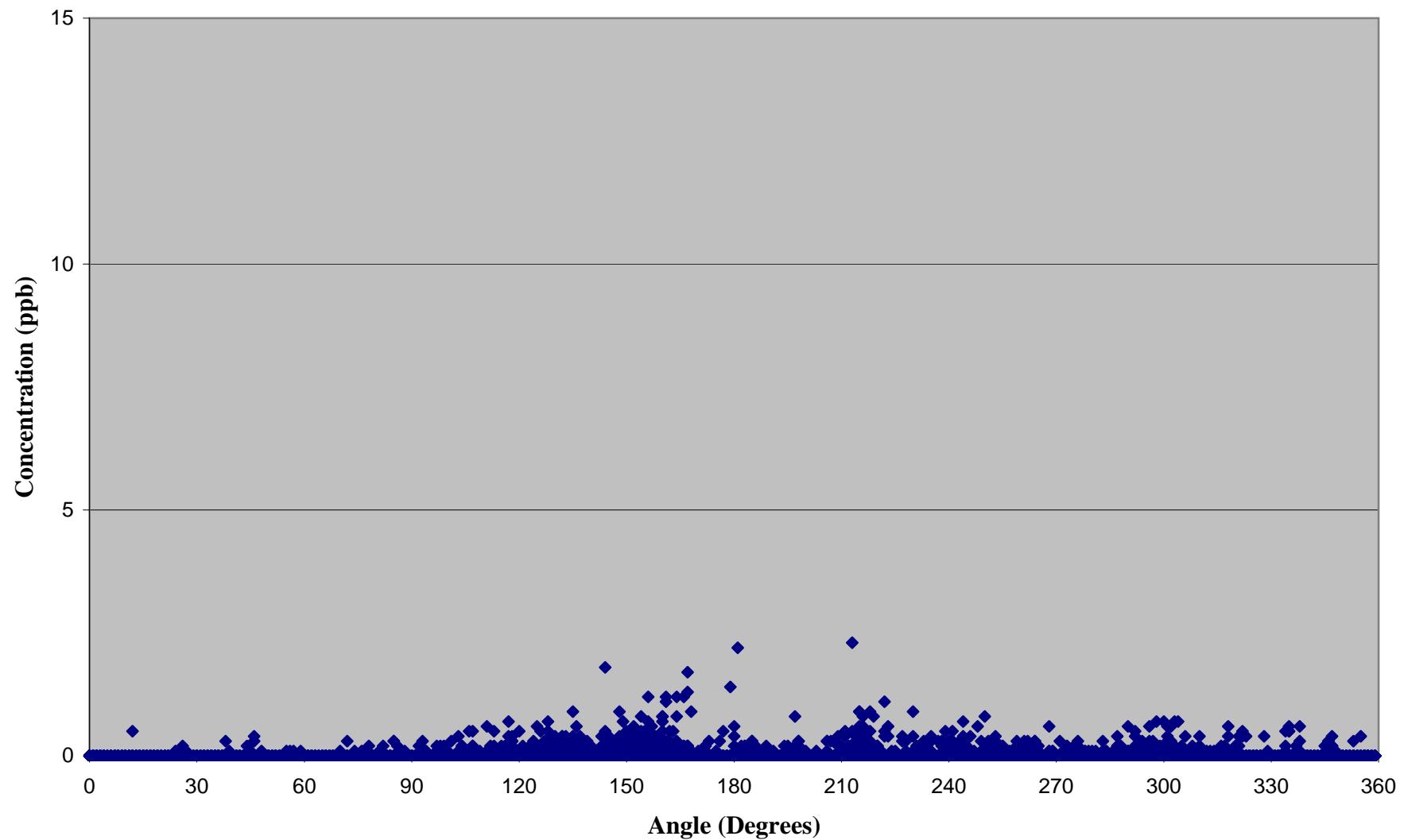
West Union CAFO: Ammonia vs Hydrogen Sulfide



West Union CAFO: Ammonia vs Wind Direction



West Union CAFO-Hydrogen Sulfide vs Wind Direction



West Union CAFO: Wind Speed vs Wind Direction

